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CONDITIONING AND COMPUTATION OF POLYNOMIALS

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ALCOHOL DRINKING BEHAVIOUR RELATED TO GSR CONDITIONING AND  
PERSONALITY FACTORS IN ALCOHOLICS

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# THESIS

## ALCOHOL DRINKING BEHAVIOUR RELATED TO GSR CONDITIONING AND PERSONALITY FACTORS IN ALCOHOLICS

### · (Summary)

This research was designed to investigate individual differences in alcohol drinking in relation to ease of conditioning a galvanic skin reflex (GSR) in male alcoholics. The hypotheses for this investigation were derived from the findings in two preliminary studies.

Pilot Study 1 An apparent similarity between behaviour defined in terms of introversion-extraversion, and drinking behaviour commonly reported by alcoholics suggested that some drinking behaviour also may relate to this personality variable. An exploratory study of these hypotheses found drinking behaviour reported by alcoholics obtaining introversive test scores on the Maudsley Personality Inventory to differ from behaviour reported by alcoholics having extraversive test scores. Introversive alcoholics predominantly reported steady drinking, solitary drinking, and a longer time between the first alcoholic blackout and the onset of frequent blackouts. Extraversive alcoholics more often reported periodic drinking, no solitary drinking, and a shorter time between first blackout and onset of frequent blackouts.

Pilot Study 2 Hypotheses were derived from literature suggesting that introversion-extraversion relates to a subject's general ability to acquire conditioned responses. Reports on the conditioned aversion treatment of alcoholism indicated individual differences among alcoholics in ease of conditioning a nausea response. Since nausea could be considered to have some autonomic response components, a laboratory study of GSR conditioning was selected to begin an examination of the relation between introversion-extraversion and autonomic conditioning in alcoholics. A conditioned GSR was found to be more quickly elicited and more slowly extinguished in introversive, than in extraversive alcoholics.

Major Study Measures of GSR conditioning were obtained from 40 male in-patients of Brookside alcoholism clinic, and from 40 non-alcoholic male volunteers. Both groups completed the Maudsley Personality Inventory and the alcoholics also reported their alcohol drinking behaviour. Ease of GSR conditioning was found not to relate to alcoholics' reports of solitary drinking, or of blackouts. Alcoholics reporting steady drinking more quickly established the conditioned GSR, and more slowly extinguished this response than did those reporting periodic drinking. Introversive subjects in the alcoholic and the nonalcoholic group were found to develop a conditioned response more quickly and to extinguish this response more slowly than extraversive subjects in these groups. No difference in GSR conditioning were observed between alcoholics and nonalcoholics. These results are consistent with predictions which might be made from Eysenck's theory of personality.



Some implications of these results were considered. To the extent that alcohol drinking is a learned response and this learning is comparable to conditioning, knowledge of characteristic individual differences in learning as indicated in GSR conditioning may be useful in accounting for patterns of steady or periodic alcohol drinking. This information might also have practical application in the conditioned aversion treatment of alcoholism, and in other therapy which employs conditioning techniques in an attempt to develop and extinguish responses.

An examination of GSR latencies demonstrated differences between alcoholic and nonalcoholic groups in relation to introversion-extraversion. These findings, in addition to certain observations of subjects who did not display GSR conditioning, led to suggestions for further research.

## BIOGRAPHY

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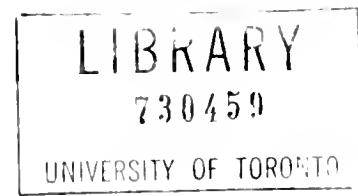
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ALCOHOL DRINKING BEHAVIOUR RELATED TO GSR  
CONDITIONING AND PERSONALITY FACTORS IN ALCOHOLICS

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## I. INTRODUCTION

Much research has been conducted in an attempt to identify typical psychological or personality characteristics peculiar to alcoholics.\* The general conclusion seems to be that nonalcoholics, in a psychiatric population and alcoholics tested after the onset of alcoholism do not differ significantly on a variety of personality tests. Writers have often suggested that personality characteristics of individuals who later develop alcoholism differ from normals who do not subsequently develop this abnormal behaviour. Any investigation of this hypothesis is difficult since there is no basis on which to make an a priori selection of subjects who later become alcoholics. Personality measures obtained from alcoholics could reflect characteristics developed through the chronic use of alcohol as well as pre-alcoholic characteristics. In view of little evidence for typical alcoholic personality traits, and the difficulty in attempting to assess psychological characteristics predisposing alcoholism, another approach to the problem of the alcoholic behaviour disorder is suggested in this thesis.

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\* The vexing question of defining "alcoholic" and "alcoholism" is too big an issue for the limitations of this thesis, but the problem has been fully treated by other writers (Seeley, 1959; Marconi, 1959). The best definitions at present are directional rather than operational. e.g. ". . . the repeated drinking of alcoholic beverages to an extent that exceeds customary dietary use or ordinary compliance with the social drinking customs of the community, and that interferes with the drinker's health, interpersonal relations or economic functioning" (Keller & Seeley, 1958, p. 19). In view of the ambiguity in definitions of this type, they are actually never employed. The more customary procedure of defining an alcoholic as a person who receives treatment in a clinic for alcoholism has therefore been employed in this thesis.



Alcoholism is defined in terms of certain behaviour related to the drinking of alcohol. It is likely that such responses are acquired or learned by an individual. Some studies have shown that responses develop and extinguish according to principles of conditioning. No attempts have been made to relate the alcohol drinking behaviour reported by alcoholics to the learning of other kinds of behaviour in these subjects. It is possible that the drinking behaviour of alcoholics may also be considered in terms of conditioning principles. If such a concept proves relevant, other factors for prediction or control of alcoholics' drinking behaviour may be found.

It may also be suggested that a personality theory of general behaviour, rather than a particular theory of alcoholic personality may be useful in accounting for some behaviour of alcoholics. Some of the variability in the drinking behaviour commonly reported by alcoholics may be accounted for by the personality factor of "introversion-extraversion" which has been found relevant to individual differences in a variety of responses.



## II. HISTORICAL REVIEW

### (a) Symptoms of alcoholism

Studies of alcoholics have attempted to identify typical personality factors or psychological functions which would differentiate them from nonalcoholics. Considerable disagreement is found in the literature as to which characteristics these might be (Sutherland, Schroeder & Todella, 1950; Syme, 1957; Wexburg, 1949). Studies with Rorschach and other projective tests have revealed no personality traits peculiar to alcoholics, or distinguishable subtypes of alcoholics (Schaefer, 1954; Schnadt, 1950; Seliger & Rosenberg, 1941; Singer, 1950). Alcoholics have not been found to have abnormal electroencephalograms (Shagass & Jones, 1957; Sutherland et al, 1950). Studies attempting to contrast personality and background development in psychiatric and alcoholic subjects have also been unfruitful (Bleuler, 1955; Diethelm, 1955; Sherfey, 1955). A survey and methodological critique of studies of educational characteristics of alcoholics and nonalcoholics concludes that no convincing evidence has been presented to support the opinion that alcoholics differ from the general population in educational attainments (Lerert, 1951). No distinctive vocational interests (Hampton, 1953; Schnadt, 1950) have been observed for alcoholics. Halpern (1946) found that alcoholics did not differ from normals or neurotics in terms of mental ability.

Studies of alcoholics which attempt to distinguish pre-alcoholic personality traits are complicated by the impossibility of separating the possible effect on personality tests of long term use of alcohol



(Hampton, 1951a; Hampton, 1951b; Hampton, 1951c). The failure to obtain evidence for the existence of any particular personality or psychological functions peculiar to alcoholics has caused some writers to suggest that "alcoholism is not a single entity or disease, but a symptom associated with several disorders . . ." (Sherfey, 1955, p. 42).

In view of the disappointing results of studies on alcoholic personality characteristics, and the suggestion that alcohol drinking behaviour may be a symptom associated with a variety of disorders, it is somewhat surprising that the actual drinking behaviour reported by alcoholics has received so little investigation.

One extensive study of alcoholics' drinking behaviour was conducted by Jellinek (1946), whose research still stands as the major reference work. A questionnaire about behaviour related to the use of alcohol was completed by 98 members of Alcoholics Anonymous. They reported whether or not they had behaved in certain ways with regard to alcohol, and if such behaviour had occurred, they estimated their age at the onset of such behaviour. Jellinek observed that some items in the questionnaire were typically reported to occur at similar time periods, while other drinking behaviour was usually reported early or late in an alcoholic's drinking history. These observations led him to formulate the concept of "phases" in alcohol drinking and in the development of alcoholism. A more detailed questionnaire was subsequently constructed by Jellinek (1952) and administered to some 2,000 alcoholics. Although he observed individual differences among alcoholics' reports of certain behaviour, he concluded that there appeared to be an "average trend" toward a sequence of behaviour symptoms which could be viewed within certain arbitrarily



defined "phases" of alcoholism. Regardless of investigators' adherence to the concept of "phases" in alcoholism, the Jellinek questionnaire items are generally held to be useful in obtaining information from alcoholics about their drinking behaviour.

Alcoholism is typically identified in terms of behaviour related to the use of alcohol. A further understanding of alcohol drinking behaviour may be obtained by relating it to other kinds of responses, or to variables which have already received considerable study. This type of approach was considered in a theoretical paper (Vogel, 1959). It suggested that some kinds of alcohol drinking behaviour reported by alcoholics have an apparent similarity to some behaviour ascribed to "introversive" and "extraversive" individuals (Eysenck, 1947; Eysenck, 1953; Eysenck, 1957). While no research on these hypotheses has yet been published, such a study seems promising in view of the numerous behaviour differences which many investigators have already considered in relation to this personality variable of introversion-extraversion (Drew, Colquhoun & Long, 1958; Eysenck, 1957, p. 28; Franks, 1956; Franks, 1957; Hildebrand, 1958; Himmelweit, 1946; Petrie, 1952; Shagass & Jones, 1958; Trouton, Casey & Eysenck, 1957; Venables, 1956).

(b) Personality theory and the behaviour of alcoholics

The particular definition of "introversion-extraversion" considered here is that taken from Eysenck's personality theory. Historically, this theory was originally based on a factor analysis of a variety of physiological, psychophysical, and psychological measures obtained from



normal and neurotic subjects (Eysenck, 1944; Eysenck, 1947). Two independent factors were extracted and in view of the kinds of behaviour items found to cluster together, Eysenck (1947) suggested that the traditional psychiatric syndromes in the field of neurosis might be broadly resolved into two orthogonal personality dimensions which could appropriately be termed "introversion-extraversion" and "neuroticism-normality." Independent investigations have subsequently found that subjects in a psychiatric population who are characterized by anxiety, reactive depression and/or compulsive features typically have high scores on tests of neuroticism and high scores on tests of introversion (or low scores of extraversion). Hysterics and psychopaths on the other hand tend to have high scores on neuroticism and high extraversion test scores (or low scores of introversion) (Eysenck, 1957, pp. 25-34). An introversive neurotic is generally considered to display such symptoms as ". . . anxiety, compulsive thoughts and actions; . . . hesitance, over-cautiousness. He is often over-aware of himself and too much concerned about his relationships with other people; he may be hyperactive and overconscientious." An extraversive neurotic is characterized by different symptoms. "He tends to be insensitive to his environment and to the feelings of others; he is often impulsive in his actions and his feelings may be shallow and superficial. He tends to be irresponsible and unreliable; he may develop escape mechanisms . . . such as amnesia or a fugue state" (Franks, 1959, pp. 3-4).

On the assumption that introversive individuals may typically display more reflective and cautious behaviour while extraversive



subjects behave more impulsively and irresponsibly, Vogel (1959) suggested that the steady or periodic drinking behaviour of alcoholics may relate to this personality factor. The introvert might " . . . be less likely to drink great amounts of alcohol at one time or to have irresponsible impulsive drinking 'sprees' or binges . . . the extravert . . . may be expected to drink considerable quantities in periodic impulsive sprees" (Vogel, 1959, p. 81).

The association of extraversion with fugues and amnesia symptoms, and the evidence that extraversion may be linked with greater susceptibility to the disrupting effects of a depressant drug like alcohol (Drew et al, 1958; Shagass & Jones, 1958) led to the hypothesis that this aspect of personality may also relate to an alcoholic's susceptibility to "blackouts." These blackouts may be defined as amnesia for one's activities and experiences, occurring after ingestion of a relatively small amount of alcohol, and enduring for a few hours. Jellinek found that the time which alcoholics report to intervene between the first blackout and the onset of frequent blackouts ranged widely from a few months to several years. "Blackouts . . . may be thought of as a type of mental dissociation phenomena which might then be theoretically linked with extraversion . . . . Since alcohol is a depressant drug, and these blackouts result upon alcohol ingestion, the occurrence of these blackouts . . . may be related to the alcoholic's position on a scale of introversion-extraversion" (Vogel, 1959, p. 80). She suggested that extraversive alcoholics would report the occurrence of blackouts more frequently than would introversive alcoholics, and that, among alcoholics reporting



blackouts, extraversive alcoholics would report a shorter time interval between the occurrence of first and frequent blackouts.

Eysenck has suggested that ". . . the introvert does not particularly care to be with people, would rather be alone" (Eysenck, 1956, p. 121). It was therefore suggested that introversion-extraversion may be related to an alcoholic's preference for drinking solitarily or in company. More "introversive alcoholics will report solitary drinking behaviour as compared with . . . extraversive alcoholics" (Vogel, 1959, p. 81).

No attempt has yet been made to investigate individual differences in alcoholics' reported drinking behaviour in relation to a personality factor which has been found relevant to variability in other kinds of responses. Such a relationship could offer the possibility of understanding or explaining individual differences in alcoholics' drinking behaviour within a broader theoretical framework of general personality theory. This personality concept of introversion-extraversion has been related to learning theory (Eysenck, 1957). There is some evidence (Franks, 1956; Franks, 1957) that this personality variable is related to the ease with which a conditioned response is acquired and extinguished. The demonstration of a relation between alcohol drinking and introversion-extraversion in alcoholics might possibly offer valuable insights on the development and extinction of this behaviour.

(c) Conditioning and alcohol drinking behaviour

Numerous writers have suggested that many behaviour patterns



are acquired or extinguished according to principles of conditioning (Dollard & Miller, 1950; Mowrer, 1950). A systematic procedure of conditioned extinction trials has been reported to satisfactorily eliminate behaviour symptoms of many psychiatric disorders (Jones, 1956; Mowrer & Mowrer, 1938; Wolpe, 1954). Such writers suggest that the processes of therapy may be considered in terms of extinguishing unacceptable behaviour and conditioning new responses which are socially desirable.

Conditioning procedures have frequently been employed with alcoholics in an attempt to develop a conditioned aversion to alcohol. As far back as the last century, Rush (1814) suggested that alcoholism should be treated by associating a painful stimulus with the taking of alcohol. While the most common method of producing a conditioned aversion is by the presentation of alcohol in conjunction with a nausea-inducing drug, this is by no means the sole technique. Mentoovich (1929), employing an electric shock as the unconditioned stimulus, reported success in producing a conditioned aversion not only to the taste of alcohol, but also to its smell and sight and even to a photograph of the bottles.

The majority of current aversion treatments of alcoholism employ an emetic drug as the unconditioned stimulus. Skipetrov (1953) describes this treatment as a classical conditioning procedure. Alcohol, considered the conditioned stimulus, is presented prior to the emetic drug (unconditioned stimulus) to evoke the unconditioned nausea response. Other workers (Voegtlin, Lemere & Broz, 1940; Voegtlin & Lemere, 1940; Voegtlin & Lemere, 1950) administer alcohol after emetine, so that the



drinking of alcohol is co-incident with the emetic-elicited nausea. This treatment might be considered as operant conditioning if "drinking alcohol" is defined as the response which receives negative reinforcement (nausea). Any evaluation of these conditioning treatments is, unfortunately, complicated by the fact that other workers administer treatment which they term "conditioned aversion," and which is conducted in complete disregard of any classical or operant conditioning principles. Barnes (1935) describes various "home remedy" types of conditioned reflex therapy which the patient conducts himself, and which apparently neglects all scientific controls and conditioning principles. Other writers (Dent, 1934; Turner, 1942) describe a "conditioned reflex" treatment in which alcohol is administered after nausea is evoked. This procedure, with the conditioned stimulus following the unconditioned response, is termed "backward" conditioning. There is ample evidence to indicate that this is the most inefficient method of developing a conditioned response (Osrood, 1953, p. 313-314).

The dearth of literature about results of conditioned aversion treatment, and the confusion of procedures permit no accurate assessment of the efficacy of this treatment. Writers who describe the treatment and results of Voegtlin's method frequently note that the conditioned nausea response is more easily established in some alcoholics. "Some patients cannot be conditioned in spite of a normal reaction with nausea and vomiting [to drug]" (Voegtlin, 1947). While there appears to be no a priori criterion on which to select the more easily conditioned patients (Voegtlin et al, 1940), it has been suggested that alcoholics who are 'indigent,' 'irresponsible,' 'psychopathic' or 'have no stable



'family ties' may have a poorer prognosis (Lemere, O'Hollaren & Maxwell, 1958; Lemere, Voegtlin, Broz & O'Hollaren, 1942; Voegtlin, Lemere, Broz & O'Hollaren, 1942). These observations suggest individual differences among alcoholics in the ease with which this conditioned nausea response is established and extinguished. While no studies have yet examined alcoholic subjects for individual differences in conditioning any response, the existing evidence on differences in conditioning behaviour may serve to guide some hypotheses about this behaviour in alcoholics.

Although the majority of conditioning studies have been concerned with establishing general laws of behaviour, it has long been known that individual differences exist in the ease with which conditioned responses are established and extinguished. In Pavlov's original research (1927; 1928) which initiated the wide use and interest in conditioning, dogs were classified into temperamental types on the basis of their modes of reaction in conditioning situations. Animals who conditioned easily appeared to Pavlov to be more "excitable" than others who seemed more "inhibitable" and conditioned slowly. Pavlov attempted to distinguish excitable and inhibitable dogs by their characteristic behaviour outside the experimental setting but found no description of naturalistic behaviour adequate to distinguish these types prior to experimentation.

Eysenck has attempted to relate the personality dimension of introversion-extraversion to the existing body of psychological learning theory by means of the concept of "cortical excitation and



inhibition."<sup>1</sup> Eysenck postulates that the behaviour differences between extraversive and introversive subjects are mainly due to disturbances in the cortical excitatory-inhibitory balance (Eysenck, 1957, p. 114). One hypothesis derived from this assumption is that introversive subjects are more 'conditionable' than are extraversive individuals.

Franks (1956; 1957) has examined Eysenck's prediction of a relation between introversion-extraversion and ease of conditioning. The eyeblink conditioning of clinically diagnosed hysterics was compared with that of "dysthymics" (i.e. patients suffering from anxiety, reactive depressions, and/or obsessive compulsions). These two patient groups would be identified respectively as "neurotic extraverts" and "neurotic introverts" in Eysenck's personality schema. The hysterics were found to acquire the conditioned eyeblink very slowly as compared to the dysthymics who conditioned quickly. Measures of conditioned galvanic skin reflex (GSR), which Franks obtained simultaneously with conditioned eyeblink, were found to give similar results although the differences were much less marked between the groups. Franks suggested that less differences in GSR conditioning were due to the low intensity air puff which he used as the unconditioned stimulus. He noted that the air puff was so weak that it sometimes failed to elicit an unconditioned GSR after the first few trials. Conditioning scores from the neurotic group containing hysterics and dysthymics, and from a normal group were found not to differ. Personality

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1. Eysenck intends his terms "excitation" and "inhibition" to refer to these concepts employed by Pavlov (1941) and Hull (1943).



tests of extraversion were also administered to these subjects.

Extraversion scores were negatively correlated with the number of conditioned GSR and eyeblink responses displayed during acquisition trials. Extraversion scores were also negatively correlated with the number of conditioned eyeblinks displayed during extinction trials. Franks reported that correlations between personality test scores and conditioned GSR extinction could not be calculated since GSR adaptation occurred too rapidly under his testing procedure. No significant correlations were obtained between personality test scores of neuroticism and any measures of conditioning. Similar results were obtained when Franks (1957) examined conditioned eyeblinking in paid normal subjects. More extraversive subjects, defined in terms of test scores on the Maudsley Personality Inventory (MPI), acquired the conditioned response more slowly and extinguished this response more quickly than did less extraversive subjects. These measures of conditioning were not related to neuroticism test scores on the MPI. Since the results in Franks' studies could have been predicted by Eysenck's theory of personality, these findings have been frequently interpreted as support for the assumption that a subject's general conditionability is related to his position on a personality scale of introversion-extraversion (Eysenck, 1957; Franks, 1959). The importance of conditioning for education, therapy and personality development has been suggested by many writers (Dollard & Miller, 1950; Mowrer, 1950). The assumption that introversive and extraversive subjects may differ in this conditioning ability suggests the possibility of tailoring education or treatment programs to the subject's capacity to acquire



new responses in a conditioning situation.

Since introversion-extraversion has been thoroughly investigated only with regard to eyeblink conditioning, there is not yet sufficient evidence to support the assumption that this personality variable is related to general ease of acquiring conditioned responses. The incidental findings on GSR conditioning which Franks (1956) has reported suggest that ease of conditioning the autonomic GSR response also relates to introversion-extraversion in normal and neurotic subjects. Literature describing conditioned aversion treatment of alcoholics frequently notes individual differences in the ease of acquiring the conditioned autonomic nausea response. On the basis of this evidence, it may be suggested that the ease of conditioning an autonomic response in alcoholics may also relate to introversion-extraversion.

(d) Summary

A survey of the research on personality characteristics of alcoholics revealed little evidence for a typical alcoholic personality. It was suggested, therefore, that a personality factor which has been found relevant to individual differences in behaviour of nonalcoholic subjects might relate also to the variability in some behaviour of alcoholics. Hypotheses were reviewed relating aspects of alcoholics' reported drinking behaviour to the personality variable introversion-extraversion as defined by Eysenck (1956; 1957).

Several theoretical articles and conditioning studies suggest that introversive subjects acquire a conditioned autonomic response more easily than do extraversive individuals. Literature on the



conditioned aversion treatment of alcoholism indicates that some patients acquire a conditioned autonomic nausea response more easily than do others. It was suggested that introversion-extraversion also may relate to the ease of conditioning an autonomic response in alcoholics.

In view of hypotheses relating introversion-extraversion to alcoholics' drinking behaviour, and other hypotheses relating this personality variable to conditioning behaviour in alcoholics, it is possible that an alcoholic's drinking behaviour may relate directly to his conditioning behaviour. To the extent that alcohol drinking is a learned response, and this learning is comparable to conditioning, knowledge of characteristic individual differences in conditioning might be useful in accounting for the development and extinction of drinking behaviour.



### III. STATEMENT OF PROBLEM

This research was designed to examine individual differences in alcohol drinking behaviour in relation to ease of conditioning an autonomic response in alcoholic subjects. This investigation was based on two preliminary studies conducted in the following order:

- 1) Certain behaviour differences have been observed between "introversive" and "extraversive" subjects (Eysenck, 1956; Eysenck, 1957). A theoretical article (Vogel, 1959) suggested that there is an apparent similarity between this behaviour and some of the drinking behaviour commonly reported by alcoholics. Hypotheses were derived from this article predicting that alcoholics obtaining introversive test scores would report solitary drinking, steady drinking and less frequent blackouts. Alcoholics having extraversive test scores were expected to report periodic drinking, no solitary drinking and more frequent blackouts. The first pilot study was designed to test these hypotheses.
- 2) Literature on conditioned aversion treatment of alcoholics suggested that individual differences exist among alcoholics in the ease with which the nausea response is conditioned. Eysenck's personality theory postulates that a subject's general conditionability is related to his position on a scale of introversion-extraversion. More introversion (i.e. less extraversion) is associated with faster acquisition and slower extinction of a conditioned response. Research on eyeblink conditioning has supported this claim, and has provided evidence suggesting that conditionability of the autonomic galvanic skin response (GSR) also may relate similarly to this personality factor



(Franks, 1956; Franks, 1957). Since a nausea response may be considered to have some autonomic response components, a laboratory study of GSR conditioning was considered to be a suitable basis on which to explore the possibility that the ease with which alcoholics acquire a conditioned autonomic response may relate to introversion-extraversion. The second pilot study reports the results of a GSR conditioning study of introversive and extraversive alcoholics.

The hypotheses of the major study were based on the findings of the preliminary studies. The first pilot study demonstrated a relation between introversive-extraversive test scores and some drinking behaviour reported by alcoholics. The second study found this personality variable also related to ease of conditioning the GSR. This evidence raised the possibility that individual differences in alcohol drinking may relate directly to ease of GSR conditioning. The drinking of alcohol may be considered to be an acquired or learned response. To the extent that this learning is comparable to conditioning, a relation between the drinking and the conditioning behaviour of alcoholics offers the possibility of accounting for the development and the extinction of alcohol drinking behaviour in terms of individual differences in conditioning. The final study was specifically designed to investigate [a] the relation between alcohol drinking behaviour and ease of conditioning the GSR in alcoholics; and [b] GSR conditioning of both normal and alcoholic subjects in relation to the personality variable of introversion-extraversion.



#### IV. TESTS AND MEASURES

Tests of introversion-extraversion, of reported drinking behaviour and of conditioning are employed throughout the three studies which follow. A description of these tests and measures is completely presented in this section to avoid needless repetition of these details in each study.

(a) Questionnaire of introversion-extraversion

The Maudsley Personality Inventory (MPI) was employed to obtain a measure of introversion-extraversion (Appendix A, pp. 4-7). The MPI test construction and item analysis are fully described by Eysenck (1956). This questionnaire contains 24 E scale (extraversion) items, 24 N scale (neuroticism) items, and other buffer questions. For the E and the N scales, two points are given to the endorsement of a keyed item, or one point if the "?" for this item is selected. The resulting possible range of scores on either scale is from 0 to 48.

Eysenck (1956) has reported mean and standard deviation of scores for normal English adults. The MPI has been used to test normal British, American and Canadian university students (Bendig, 1958; Star, 1957; Vogel, 1958). A comparison of the reported means, standard deviations, reliability and intercorrelations between N and E scales for these samples is presented in Table 1. Eysenck's (1956) mean E scale score

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TABLE 1

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TABLE 1

Mean, standard deviation, reliability and intercorrelation of scores on extraversion (E) and neuroticism (N) scales of the Eysenck Personality Inventory

<u>Sample</u>	<u>n</u>	<u>E scale scores</u>		<u>N scale scores</u>		<u>r<sub>EN</sub></u>	<u>E scale</u>	<u>N scale</u>	<u>Reliability</u>
		<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>				
Normal adult males (Eysenck, 1956)	200	24.62	10.04	17.81	11.32	-.15	.85 <sup>1</sup>	.90 <sup>1</sup>	
Normal adults, mixed (Eysenck, 1956)	400	24.89	9.67	18.63	11.19	-.09	.83 <sup>1</sup>	.88 <sup>1</sup>	
English university students, male (Star, 1957)	213	25.26	8.85	23.23	11.27	-.07			
American university students, mixed (Bendig, 1957)	145	27.77	7.60	21.57	9.75	-.20	.74 <sup>2</sup>	.84 <sup>2</sup>	
Canadian university students, mixed (Yogel, 1958)	137	27.80	7.87	22.86	10.27				

1. Corrected split half reliability

2. Kuder-Richardson "Formula 20"



for males does not differ from mean scores obtained from the other groups. Since the mean score reported by Eysenck has frequently been employed to dichotomize a sample into "introversive" and "extraversive" groups, this procedure was also employed in this research. An "introversive" subject was defined as one who obtained an E scale score of 24 or less; the "extraversive" subject was identified by a score of 25 or more.

Jensen (1958) conducted a survey of MPI scores from 18 groups. No significant correlations were found between test scores and age or sex. Jensen concluded that the reliabilities of both the E and N scales are high for a personal inventory test, and compare favourably with the reliability of cognitive tests such as the Stanford-Binet and the Wechsler Intelligence. A recent study (Bartholomew and Marley, 1959) examined the temporal reliability of E and N scale scores on the MPI. Test-retest scores were obtained from a general hospital, and an imprisoned group of 90 subjects over an 18 month period. The resulting correlations ranged from + .62 to + .80. It was concluded from this evidence that both scales have satisfactory temporal reliability and that scores on these questionnaires are apparently unaffected by hospital treatment or imprisonment. Other studies employing the MPI (Drew et al., 1958; Franks, 1957; Trouton et al., 1957; Venables, 1956) have found E and N scale scores to relate to variability in numerous kinds of behaviour.

(b) Questionnaire for reported alcohol drinking behaviour

The questions (Appendix A, pp. 2 & 3, items 2, 3, 13, 14, 15)



relating to periodic or steady drinking, solitary drinking and occurrence of first and frequent blackouts were selected from Jellinek's 1946 revised questionnaire of alcohol drinking behaviour. Although this questionnaire has been administered to large numbers of alcoholics and Jellinek's studies imply that the behaviour reported by an alcoholic is identical to the behaviour which would be observed when the alcoholic is drinking alcohol, there is no actual evidence on the validity of this questionnaire. It should be noted that the studies presented in this thesis do not assume test validity. All predictions about alcohol drinking behaviour and discussions of these phenomena refer to the reported behaviour as indicated by the alcoholic's responses to the paper and pencil test items.<sup>2</sup>

In an attempt to assess the reliability of the alcoholics' responses to these behaviour items, the questionnaire was first employed in an exploratory manner with 10 alcoholic in-patients of Brookside Clinic. A subject's reply to each drinking item in this inventory was compared with his reply to the same item in the complete Jellinek questionnaire which is routinely completed by all patients on admission to the clinic. Similar replies were obtained from both questionnaires. A further comparison was made between the alcoholic's questionnaire responses about drinking behaviour and his report of this to an interviewer<sup>3</sup> who was not involved with this study. In the opinion

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2. Although no reference to actual alcohol drinking behaviour is intended in any instance, the qualification "reported behaviour" is occasionally omitted to avoid needless repetition.
3. The writer is grateful for the assistance of Dr. W. Schmidt, Research Associate, Alcoholism Research Foundation, Toronto.



of the interviewer and this experimenter, both the questionnaire and the interview technique obtained essentially similar and consistent information. For this reason, the questionnaire was employed in this study as the most economical method of collecting data on alcohol drinking behaviour.

The responses to the question of solitary drinking (Appendix A, p. 3 item 15) were treated dichotomously. Subjects were classified into two groups; one which reported solitary drinking, and one which reported "never" behaving in this manner.

The subject was required to decide (Appendix A, p. 2 items 2, 3, 4) if he considered himself at the present time to be more typically a "steady drinker" (drinking more or less the same amount at regular frequent intervals), or a "periodic drinker" (drinking in bouts of two, three or more days, either not drinking at all between bouts, or only very moderately). On the basis of the replies to these questions, the alcoholics were divided into a group reporting steady drinking and a group reporting periodic drinking.

Alcoholics estimated the number of bottles of beer, or wine, or spirits which they usually consumed in a drinking day (Appendix A, p. 2, items 3c, 4a). There is no evidence, as yet, to indicate if the number of bottles an alcoholic reports consuming is actually the amount drunk by the subject. For the purposes of this study, however, these numbers were assumed to have the same properties as those attributed to numbers of bottles. To permit some comparison of subjects' reported alcohol consumption, their estimates were converted to ounces of absolute alcohol on the basis of the Liquor Control Board of Ontario regulations governing



bottle size and per cent alcohol contained in these domestic beverages (Popham & Schmidt, 1958, p. 31). Subjects' scores of absolute alcohol intake per drinking day were employed as ordinal scale units, to rank order subjects in terms of alcohol consumption.

An alcoholic blackout refers to amnesia for one's activities and experiences, occurring after ingestion of a relatively small amount of alcohol, and enduring for a few hours. The alcoholic was asked to report his age at first blackout<sup>4</sup>, and at the onset of frequent<sup>5</sup> blackouts (Appendix A, p. 3, items 13, 14). Since evidence on the validity of this questionnaire is not yet available, the numerical difference between these two reported ages may not indicate the number of years actually intervening between these events. For the purposes of this research, the numbers employed by the subject to indicate his age at first and at frequent blackouts were assumed to have the same properties as numbers of years. The numerical difference between these two ages was employed to indicate the number of years reported to intervene between these two events. These difference scores were used as ordinal scale units, to rank order the subjects. The sample was dichotomized at the median, into two groups; one reporting a shorter time between first and frequent blackouts, and one reporting a longer time between these events. No difference score was obtained for a subject if he reported that a blackout had "never" occurred.

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4. A "blackout" is described by Jellinek (1946) as "wake up in the morning after a party with no idea where you had been or what you had done after a certain point."

5. "Increasing frequency" of blackouts is defined as "at least 2 or 3 times out of ten drunks" (Jellinek, 1946).



(c) GSR conditioning procedure and measures

The galvanic skin reflex (GSR), equally well known as psycho-galvanic response (PGR), electrodermal response (EDR), and palmar skin resistance, has been used by researchers as a peripheral autonomic index of "emotionality," the term emotionality being used to mean, variously, startle, or tension or anxiety or anticipation or alertness or apprehension. Woodworth and Schlosberg (1955, pp. 137-159) discuss the technique of measuring this response. They suggest that the galvanic skin reflex, measured by change in skin resistance to electrical current, serves as an index of sympathetic discharge.

Woodworth and Schlosberg (1955) report that a sudden noise will cause a sharp decrease in skin resistance. Several studies of GSR conditioning (Welch & Kubis, 1947a; Welch & Kubis, 1947b; Mitchell, 1958; Mitchell, 1959) have employed this reaction as an unconditioned response to an unconditioned bell stimulus. The conditioned stimulus has been one particular nonsense syllable, occurring in a repeated but random order, in a list of nonsense syllables presented to the subject by a memory drum.

The conditioning procedure in this thesis employed a loud ringing bell beneath the subject's desk as the unconditioned stimulus to evoke an unconditioned response of abrupt decrease in skin resistance. The conditioned stimulus was a specific nonsense syllable, "LAJ," presented to the subject 16 times in a series of 51 syllables appearing in the memory drum. These syllables were obtained from Glaze's (1928) list of low association syllables. A different syllable appeared in the aperture of the drum every six seconds. The subject was required to



spell each one as it was presented. In order that he would not know when to expect the conditioned stimulus, it occurred in random order among the buffer syllables.

The measurable range of skin resistance on the Hunter model 300 GSR amplifier was from a theoretical zero to 43,000 ohms. The amplifier electrodes, consisting of two cellulose rubber discs inserted in stainless steel cups, were clamped to the dorsal and palmar surface of the subject's left hand. An Esterline Angus pen recorder connected to the amplifier permitted a complete graphic record of all skin conductance changes. A milliampere scale on the front of the amplifier cabinet displayed the galvanometric deflections, which ranged from -2.5 to + 2.5 milliamperes. A horizontal scale at the top of the cabinet indicated the subject's basal resistance in 1,000 ohm units. By balancing the bridge to the subject's skin resistance a moment before each syllable was presented, the pen was automatically centered at zero on the record chart. The size of the pen deflection on the chart was a constant function of the ohm change in skin resistance. For example, a 200 ohm response would result in the same size pen deflection regardless of whether the basal resistance was high or low. The size of the pen deflection on the chart thus could be employed directly to indicate the amount of skin resistance change which occurred to each stimulus. In order that changes in resistance which accompanied the conditioned and unconditioned stimuli could be accurately identified, an additional side pen for the record chart was wired into the electrical circuit for the bell and the memory drum. This pen automatically marked the chart the moment the bell or the unreinforced



LAJ syllable were presented to the subject.

A fifty per cent reinforcement schedule, identical to that described by Welch & Kubis (1947a; 1947b) was employed in this study. The buzzer sounded 0.5 seconds after the first conditioned syllable, "LAJ," was presented in the memory drum. No bell was rung the second time this stimulus was displayed. The third presentation of the conditioned syllable was again followed in 0.5 seconds, by the bell stimulus. This reinforcement pattern was continued throughout the acquisition trials.

A preliminary exploration of this technique was conducted with 20 normal subjects. When subjects began the task, they generally displayed large increases or decreases in skin resistance to the first few syllables which they spelled. As the task continued, the record became fairly regular and each presentation of a syllable was accompanied by small increases or decreases in skin resistance (i.e. small pen deflections about zero base line were observed). The bell stimulus regularly evoked large decreases in skin resistance (i.e. large pen deflections above zero base line were observed). Since the maximum GSR response was generally observed within five seconds after the presentation of a stimulus (i.e. the maximum pen deflection from zero base line occurred), a six second interval between the presentation of each nonsense syllable was found to be satisfactory for recording change in skin conductance to each syllable. By the end of six seconds, the subject's skin resistance was returning to a base level (i.e. the pen was moving toward center zero on the chart). Just before the next syllable was presented, the GSR amplifier bridge was balanced to the



subject's basal skin resistance at that moment. This automatically brought the pen recorder to center zero base line on the chart, and the subject's GSR response to the next syllable was similarly recorded.

The conditioned GSR, as defined by Welch & Kubis (1947a; 1947b), was identified by observing a subject's responses in his record chart. A conditioned pattern involved six presentations of the LAJ syllable (three followed by bell, alternating with three unreinforced), and the presentation of all buffer syllables intervening between these LAJ syllables. Large pen deflections above base line (i.e. decreases in skin resistance) were observed to occur to the conditioned syllable accompanied by the bell. The conditioned response was considered to be established when similar pen deflections accompanying three consecutive presentations of the unreinforced conditioned syllable were larger than any pen deflections above the base line occurring to the intervening neutral stimuli. Figure 1 presents a typical record of the defined

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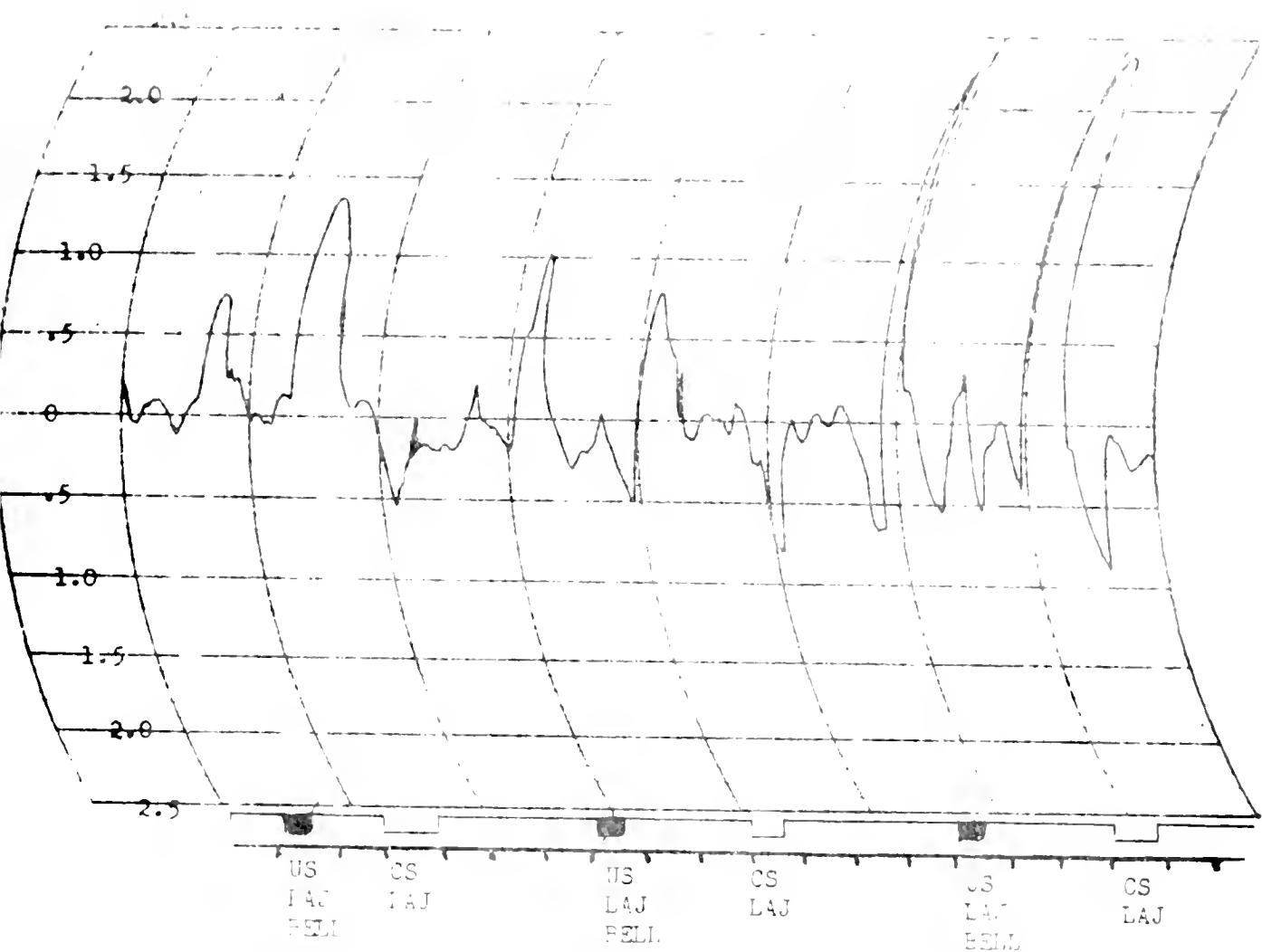
FIGURE 1

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conditioned pattern.

The chart recording changes in skin resistance moved at the rate of three inches per minute. Fourteen inches of this chart were visible to the experimenter at all times. This represented 4.66 minutes of testing, or the presentation of 46 syllables. A crucial conditioning sequence (three reinforced and three unreinforced conditioned syllables plus intervening neutral syllables) usually involved a total presentation of 16 to 20 syllables. Since the con-





Deflections above zero base line indicate decrease in skin resistance to each syllable stimulus. The pen charts the occurrence of the critical 'U' and 'J' stimuli.

FIGURE 1

Example record of W<sup>2</sup> conditioning criterion



ditioning pattern was required to occur on consecutive presentations of the conditioned syllable, these responses were easily observed at the top of the chart where the pen was recording. Although the side pen marked the presentation of the conditioned and unconditioned stimuli, the defined conditioning pattern was readily identified by visual inspection of the record. The bell reinforced conditioned syllable regularly evoked abrupt pen deflections about  $3/4"$  to  $2"$  above the zero base line. After the subject spelled the first few syllables, the unreinforced syllables evoked small pen deflections, about  $1/4"$  to  $1/2"$  above base line, or else the deflections occurred below base line. After the conditioning procedure continued for a time, the presentation of the unreinforced conditioned LAJ syllable was either accompanied by a large pen deflection above base line, or else the pen deflection was not distinguishably different from the minor deflections about base line which accompanied the buffer stimuli. On the basis of these preliminary observations, a scoring procedure similar to that of Welch & Kubis was adopted.

A subject's score on trials to acquire the conditioned response was determined by the number of reinforcements (i.e. the number of presentations of the bell) required before the defined conditioning pattern was observed in his record. A larger score was considered to indicate slower or "poorer" conditioning. In normal and psychiatric groups, GSR conditioning scores have been found not to relate to age, sex or intelligence (Franks, 1956; Welch & Kubis, 1947a). Scores on rate of GSR conditioning are found to have retest reliability which is independent of the particular conditioned nonsense syllable employed in



the conditioning procedure (Welch & Kubis, 1947a). A conditioned GSR to a nonsense syllable was established in 36 normal subjects. When these subjects were conditioned one month later using a different conditioned nonsense syllable, a correlation of .88 was obtained between the subjects' two scores of trials to acquire the conditioned GSR.

The preliminary exploration of the conditioning procedure revealed that acquisition trials could not be continued satisfactorily much longer than 17 minutes, as subjects appeared to become restless. They frequently made slight shifts in posture, or sighed, or began to laugh and make comments to the experimenter. Such activity usually caused abrupt changes in skin resistance, and the regular pattern of pen deflections could no longer be obtained from the subject's chart. The experimenter attempted to reduce this behaviour by initial instructions to the subject before the conditioning procedure began. The disastrous effect of this behaviour on a chart record was demonstrated by the experimenter, using herself as the subject. These instructions appeared to reduce such restless behaviour during the experiment, but satisfactory records beyond 17 minutes were still not reliably obtained. In view of this difficulty, it was thought wise to terminate testing before this time. An arbitrary limit of 15 minutes 10 seconds was accordingly placed on the acquisition trials. This maximum time limit permitted the presentation of a total of 153 nonsense syllables. In this series, the conditioned syllable occurred 24 times with the bell and 24 times without reinforcement. This time limit was considered to be satisfactory since subjects in the preliminary investigation of conditioning procedure



displayed the conditioning pattern prior to 24 reinforcements, and restlessness did not appear before 17 minutes.

The exploration of conditioned GSR extinction seldom observed a conditioned response after seven extinction trials. The procedure of Welch & Kubis (1947a; 1947b), of presenting 10 extinction trials, was therefore employed. As soon as a subject displayed the conditioning pattern, his extinction trials commenced. He was permitted to continue spelling syllables as they appeared in the memory drum, until 10 LAJ syllables were presented. These 10 presentations were not accompanied by bell reinforcement. An index of conditioned GSR resistance to extinction was obtained from the pen chart deflection above the zero base line (i.e. decreases in skin resistance) observed to accompany the presentations of the unreinforced LAJ syllable. The number of decreases in skin resistance, which were larger than any decreases displayed by the subject to the neutral syllables, was considered to indicate the number of conditioned GSR's displayed in the 10 extinction trials. A larger score was interpreted as greater resistance to extinction. During the extinction trials, a subject's chart usually displayed small pen deflections above and below zero base line. Accurate identification of the pen deflections to the unreinforced syllable stimulus was permitted by the side pen which marked the chart the moment the conditioned syllable was presented. When the defined conditioned response occurred, the pen deflections above zero base line were generally of such a large size that they could be unambiguously identified by visual inspection of the subject's chart.



## V. PILOT STUDIES

### 1. The relation between alcohol drinking behaviour and personality factors in alcoholics

#### INTRODUCTION

A theoretical article (Vogel, 1959) suggested that some of the variability in alcohol drinking behaviour of alcoholics might relate to the personality factor of introversion-extraversion. This exploratory study is designed to examine some hypotheses derived from Vogel's article.

Since extraversion has been linked with fugues and amnesia behaviour (Eysenck, 1957, pp. 226-229), and with greater susceptibility to the disrupting effects of depressant drugs like alcohol (Drew et al., 1958; Shagass & Jones, 1958), it was suggested that the more extraversive alcoholics may report greater susceptibility to alcoholic blackouts, and to the rapid onset of frequent blackouts. Since a preference for, and enjoyment of solitude is assumed to be an introversive characteristic (Eysenck, 1956), it could be suggested that the solitary drinking behaviour which some alcoholics report may be associated with more introversion (i.e. less extraversion).

Introversive subjects are assumed to behave in a more cautious controlled fashion while more impulsive irresponsible behaviour is ascribed to extraversive individuals (Eysenck, 1953; Eysenck, 1957; Franks, 1959). It seemed likely that introversive alcoholics would be more prone to report a steady, controlled pattern of drinking, while impulsive, periodic drinking sprees might be more typical of extraversive alcoholics.



The hypotheses to be investigated in this study are summarized below:

- (1) Introversive alcoholics will report the occurrence of blackouts less frequently than will extraversive alcoholics.
- (2) Introversive alcoholics will more often report a longer time between the first blackout and the increasing frequency of these blackouts, than will extraversive alcoholics.
- (3) Introversive alcoholics will more frequently report solitary drinking behaviour than will the extraversive alcoholics.
- (4) Introversive alcoholics will more frequently report a steady drinking pattern, while extraversive alcoholics will more often report periodic drinking. If introversive alcoholics are observed to report a controlled steady pattern of drinking, it could be suggested that they will more frequently report lower intake of absolute alcohol per drinking day than will extraversive alcoholics, who are assumed to report a pattern of spasmodic drinking bouts.

A group of alcoholics who are hospitalized because of their drinking behaviour may be considered less "well adjusted" or more "neurotic" than a "normal" group (i.e. not hospitalized for alcoholism or other psychiatric disorder). It may be predicted that these two groups would differ on a test of neuroticism; alcoholics will have higher (i.e. more neurotic) scores than will normals. Since neuroticism, or maladjustment is claimed to be unrelated to introversion-extraversion (Eysenck, 1957, pp. 11-34), normal and alcoholic groups should not differ on a test of introversion-extraversion.



### METHOD

Sixty-eight male alcoholic in-patients of Brookside Clinic (an alcoholism treatment facility) completed a "research questionnaire" (Appendix A), which contained questions on drinking behaviour and the NPI. A complete description of these tests and the scoring procedures are contained in chapter IV of this thesis. The subjects completed this questionnaire in weekly test groups conducted by the experimenter. Each group contained all the male patients who were admitted to the clinic subsequent to the last test meeting. Since the number of clinic admissions fluctuated from week to week, these sessions occasionally involved only one subject. The research questionnaire was consequently administered on an individual or a group basis. The patients were simply instructed to complete the questionnaire. In the rare case that an alcoholic expressed difficulty in answering an item, he was encouraged to select the answer which he felt was "most typical of him at the present time." All subjects were strongly urged to leave no question blank, and to make a "best guess" rather than omit any answer.

The sample contained three patients who spoke little English and had such severe language problems that they apparently could not read or comprehend the questionnaire. Such difficulties made it impossible for them to complete the test. The testing of seven alcoholics in this sample was unavoidably interrupted before their questionnaires were completed. In some cases this was due to the unexpected arrival of visitors for the patient. In other instances these patients had



dental or medical appointments, or employment interviews with individuals outside the clinic setting. These interruptions could not be avoided, but there was no reason to suspect that they occurred in any systematic fashion with regard to the experimental variables investigated in this study. Rather than have these alcoholics complete the questionnaire at some later date and introduce the possibility that they might discuss the questions with someone other than the experimenter, or collaborate on answers, these subjects were not required to complete the questionnaire and they were not employed in the study.

The final sample contained 58 alcoholics, arranged into two groups according to their extraversion (E) scale scores on the MPI. The "introvert" category contained subjects with scores of less than 25, while the "extravert" group contained subjects having scores of 25 and over. No significant difference in neuroticism (N) scores on the MPI was obtained between these two groups of alcoholics.

### RESULTS

The mean and standard deviation in N and E scale scores of the MPI for 58 male alcoholics is compared with these values for 200 normal adult males (Eysenck, 1956) in Table 2. In accord with the experimental

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TABLE 2

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hypotheses, the alcoholic males have significantly higher neuroticism scores than normal males, but these two groups do not differ significantly in extraversion scores.



TABLE 2

Mean and standard deviation for extraversion (E) and neuroticism (N) scores on the Maudsley Personality Inventory

Sample	n	E scale scores			N scale scores		
		mean	SD	CR	mean	SD	CR
Alcoholic males	58	22.5	8.25		35.8	10.37	
Normal males	200	24.6	10.04	1.46*	17.8	11.32	10.92**

\* with 256 df,  $p > .10$

\*\* with 256 df,  $p < .01$



The difference between an alcoholic's age at first blackout and at onset of frequent blackouts was calculated in the manner described in chapter IV. Since eight subjects reported never having a blackout, difference scores were only obtained from 50 subjects. These scores were employed to arrange the cases into five year categories. The chi square analysis presented in Table 3 reveals a significant difference

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TABLE 3

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in the resulting frequency distribution within each group. This evidence supports the experimental prediction that introversive alcoholics will more often report a longer time between first blackout and onset of frequent blackouts, than will extraversive alcoholics. Subjects in the extravert category are found to predominantly report differences of five years and less between these events, while those in the introvert category predominantly report differences of five years and over.

An analysis, (Table 4) of gross frequency of reported blackouts

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TABLE 4

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reveals no significant difference in the number of alcoholics in each group never having a blackout.

A chi square analysis performed on the number of solitary drinkers in each alcoholic group is summarized in Table 5. It reveals

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TABLE 5

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TABLE 3

Frequency distribution of differences between age at first blackout and at onset of frequent blackouts reported by introversive and extraversive alcoholics

<u>Psychological category</u>	<u>Number of cases</u>			<u>Total</u>
	<u>Under 5 years</u>	<u>5 to 10 years</u>	<u>Over 10 years</u>	
Introvert	11	7	7	25
Extravert	20	4	1	25

$$\chi^2 = 7.94 \text{ with 2 d.f.}; p < .05$$



TABLE 4

Frequency distribution of reported blackouts  
in introversive and extraversive alcoholics

<u>Psychological category</u>	<u>Number of cases</u>		
	<u>Blackouts</u>	<u>No blackouts</u>	<u>Total</u>
Introvert	25	6	31
Extravert	25	2	27

$\chi^2 = 0.87$  with 1 df,  $p > .05$



TABLE 5

Frequency of reported solitary drinking in  
introversive and extraversive alcoholics

<u>Psychological category</u>	<u>Drink solitarily</u>	<u>Never drink solitarily</u>	<u>Total</u>
Introvert	26	5	31
Extravert	14	13	27

$\chi^2 = 5.49$  with 1 d.f.;  $p < .05$



that a predominance of introversive subjects report solitary drinking.

An analysis of the frequency of reported steady or periodic drinking in the two groups is presented in Table 6. The results support

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TABLE 6

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the hypothesis that steady drinking is more frequently reported by introversive alcoholics and periodic drinking is predominantly reported by extraversive alcoholics.

Table 7 presents a chi square analysis of alcoholics' scores of

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TABLE 7

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absolute alcohol consumption per drinking day. The significant difference in the distribution of scores in introvert and extravert categories supports the hypothesis that lower alcohol consumption is more often reported by introversive than by extraversive alcoholics.

#### CONCLUSION

This study demonstrated some relations between alcoholic subjects' test scores of introversion-extraversion and drinking behaviour which they report. Introversive alcoholics differed significantly from extraversive alcoholics on the following drinking behaviour:

(1) Introversive alcoholics reported a longer time to intervene between first blackout and onset of frequent blackouts than did extraversive alcoholics.



TABLE 6

Frequency of reported steady or periodic drinking  
among introversive and extraversive alcoholics

<u>Psychological category</u>	<u>Steady drinking</u>	<u>Periodic drinking</u>	<u>Total</u>
Introvert	24	7	31
Extravert	2	25	27

$$\chi^2 = 25.83 \text{ with 1 d.f.}; p < .01$$



TABLE 7

Ounces of absolute alcohol reportedly consumed per drinking day by introversive and extraversive alcoholics

<u>Psychological category</u>	<u>Number of cases</u>			<u>Total</u>
	<u>Under 10 oz.</u>	<u>10 to 20 oz.</u>	<u>Over 20 oz.</u>	
Introvert	14	17	0	31
Extravert	3	16	8	27

$\chi^2 = 11.78$  with 2 d.f.;  $p < .01$



(2) Introversive alcoholics more frequently reported drinking solitarily than did extraversive alcoholics.

(3) Introversive alcoholics predominantly reported a behaviour pattern of steady drinking while extraversive alcoholics predominantly reported periodic drinking. In line with this finding, introversive alcoholics also reported lower alcohol consumption per drinking day than did extraversive alcoholics.

(4) The sample of alcoholics employed in this study was observed to have significantly higher neuroticism scores than a normal sample, but the extraversion scores for alcoholics were found not to differ significantly from normals.

No significant difference between the introversive and extraversive alcoholic group was observed in the reported presence or absence of alcoholic blackouts.

The findings of this study were obtained from English speaking male in-patients of Brookside Clinic for alcoholism. Although further research is required to examine the extent to which these results may be generalized, Brookside Clinic patients are referred from a variety of sources, and admission is not restricted on any economic basis, it seems likely that the results obtained in this study may apply to English speaking male in-patients in other clinics for the treatment of alcoholism.



2. The relation between conditioning behaviour  
and personality factors in alcoholics

INTRODUCTION

Alcoholism is frequently considered to involve certain learned or acquired alcohol drinking responses. Writers have suggested that conditioning principles could be employed to extinguish this behaviour. The conditioned aversion treatment of alcoholism attempts to develop a conditioned nausea response to alcohol. While the procedures in this treatment vary considerably, therapists who appear to use some controlled conditioning techniques consistently observe, "Some patients cannot be conditioned in spite of a normal reaction with nausea and vomiting [to drug]" (Voegtlin, 1947). "It is important to select the right kind of alcoholic for this procedure. For some it is quite inappropriate." (Carter, 1943). These observations suggest individual differences among alcoholics in ease of establishing a conditioned nausea response. No investigation of such an hypothesis has yet been reported.

Some writers have suggested that a subject's general ability to acquire conditioned responses is related to his position on a scale of introversion-extraversion (Eysenck, 1957; Franks, 1959). Franks (1956; 1957) has conducted studies with both normal and neurotic subjects to investigate the relation between introversion-extraversion and the ease of eyeblink conditioning. He found this conditioned response to be more quickly established and more slowly extinguished in introversive than in extraversive subjects. This conditioning behaviour also was



found to be unrelated to the subject's neuroticism as defined by test scores on the Maudsley Personality Inventory.

If conditionability is related to introversion-extraversion, the ease of conditioning other responses may be expected to relate to this personality factor. Little research is yet available to test such an hypothesis. There is some suggestion in Franks' work (1956) that speed of GSR conditioning also may relate to introversion-extraversion. He measured GSR and eyeblink conditioning simultaneously. This technique was reported to be somewhat unsatisfactory for GSR conditioning, but higher extraversion test scores were found to be associated with slower acquisition of a conditioned GSR. No other investigation of conditioned GSR acquisition in relation to extraversion scores has been reported, and no evidence is available on the relation between extinction of a conditioned GSR and test scores of extraversion. Since the GSR is an autonomic response, a conditioning study of this response would have theoretical value in testing the prediction that introversion-extraversion is related to the speed of conditioning responses in addition to the eyeblink. Since a nausea response may be considered to have some autonomic response components, a GSR conditioning study with alcoholic subjects would be of further value in beginning an examination of individual differences among alcoholics in conditioning an autonomic response.

The hypotheses for an investigation of GSR conditioning in alcoholics may be presented as follows:

(1) A conditioned GSR will be elicited in fewer reinforced trials and will be more resistant to extinction in introverts than



in extraversive alcoholics.

(2) No significant relation between measures of conditioning and neuroticism will be obtained in the group of alcoholics.

#### METHOD

A research questionnaire which contained the MPI (Appendix A, pp. 4-7) was completed by a sample of male in-patients at Brookside Clinic (an alcoholism treatment facility). Individual appointments were arranged with the subjects for the test of GSR conditioning. Chapter IV in this thesis describes the LFI and the conditioning procedure. All subjects received identical instructions (Appendix B) from the same experimenter, who did not know the questionnaire results for any subject prior to conditioning trials. When each subject arrived for testing, he was seated before a memory drum which was placed on a desk. He sat before the desk for about five minutes prior to beginning the actual conditioning session. During this time the experimenter demonstrated the apparatus. By emphasizing the sensitivity of the GSR measure to the subject's slightest movement or activity, the test was presented as a measure of relaxation or repose, and the task of reading nonsense syllables as one simple activity, standard for all subjects, so that their measures would be comparable.

Some research indicates that tranquilizing and other depressant drugs make eyeblink and GSR conditioning more difficult (Franks & Trouton, 1958; Mitchell, 1958; Mitchell, 1959). To preclude the possibility of confounding the effects of drug and personality variables,



no alcoholics were tested while under sedation.

The experimental sample contained a total of 22 subjects. These were divided, according to their extraversion (E) scale scores, into introvert (score of 24 or less), and extravert (score of 25 or more) groups. The number in each group was 12 and 10 respectively. Scores on conditioning and extinction could not be obtained from three subjects (one introvert, two extraverts) who did not display the conditioning criterion within 24 acquisition trials. The resulting sample contained a total of 19 cases: 11 subjects in the introvert group and 8 in the extravert group.

### RESULTS

The results of a t-test of the difference between the introvert and the extravert group in mean trials to condition is presented in Table 8. In support of the experimental hypothesis, the alcoholics in

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TABLE 8

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the extravert category required a significantly greater number of reinforced trials before the conditioned response was displayed.

Table 9 summarizes a t-test of the difference between the two

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TABLE 9

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groups in number of conditioned responses elicited during extinction trials. This result is in accord with the experimental hypothesis.



TABLE 8

Trials to condition in the introvert and  
the extravert group of alcoholics

Group	n	Mean	S.D.	t
Introvert	11	5.18	1.75	3.59*
Extravert	8	12.25	5.85	

\* with 17 d.f.;  $p < .01$



TABLE 9

Conditioned responses during extinction trials in the introvert and the extravert group of alcoholics

Group	n	Mean	S.D.	t
Introvert	11	6.18	2.12	3.57*
Extravert	8	2.25	2.39	

\* with 17 d.f.;  $p < .01$



The conditioned GSR response of alcoholics in the introvert group was more resistant to extinction than that of subjects in the extravert category.

Regression analyses (Snedecor, 1956) were conducted to investigate further the hypothesis that these conditioning measures are a function of the extraversion test scores, and are unrelated to neuroticism measures. A summary of these analyses is presented in Tables 10 and 11.

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TABLES 10 and 11

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The significant regression (Table 10) of conditioning trials on extraversion scores is in line with the experimental hypothesis. The positive  $b_{y.x}$  value indicates that the number of trials required to elicit the conditioned GSR increased as a function of increasing extraversion scores. The significant regression of conditioning scores on neuroticism measures is counter to the experimental null hypothesis. Table 11 reveals a significant regression of extinction scores on extraversion. The negative  $b_{y.x}$  value is in the predicted direction, and indicates that the number of conditioned GSR's observed during extinction trials decreased as a function of increasing extraversion scores. The evidence that extinction scores are also a function of neuroticism measures is contrary to the experimental null hypothesis.

On the basis of the evidence presented in Tables 10 and 11, the experimental hypotheses of a positive relation between number of conditioning trials and extraversion, and a negative relation between extinction scores and extraversion may be accepted. These analyses



TABLE 10

Regression analyses of trials to condition (Y) on personality scores (X)

## (a) Extraversion scores (X):

Sum of squares <i>X</i>	Sum of squares <i>XY</i>	Sum of squares <i>Y</i>	Regression <i>b</i>	df	SD from regression <i>S<sub>y.x</sub></i>	SD of regression coefficient <i>S<sub>b</sub></i>	t
1389.69	489.79	538.53	.352	17	4.64	.124	2.84*

## (b) Neuroticism scores (X):

Sum of squares <i>X</i>	Sum of squares <i>XY</i>	Sum of squares <i>Y</i>	Regression <i>b</i>	df	SD from regression <i>S<sub>y.x</sub></i>	SD of regression coefficient <i>S<sub>b</sub></i>	t
2884.11	-604.95	538.53	-.209	17	4.92	.092	2.27*

\* with 17 df,  $p < .05$



TABLE 11

Regression analyses of extinction scores (Y) on personality scores (X)

## (a) Extraversion scores (X):

Sum of squares X	Sum of squares XY	Sum of squares Y	Regression $b_{y.x}$	df	SD from regression $S_{y.x}$	SD of regression coefficient $S_b$	t
1389.69	-307.37	166.74	-.221	17	2.41	.065	3.40**

## (b) Neuroticism scores (X):

Sum of squares X	Sum of squares XY	Sum of squares Y	Regression $b_{y.x}$	df	SD from regression $S_{y.x}$	SD of regression coefficient $S_b$	t
2384.11	338.84	166.74	.117	17	2.73	.050	2.34*

\* with 17 df,  $p < .05$ \*\* with 17 df,  $p < .01$



also revealed that the null hypotheses of no relation between neuroticism and acquisition, and neuroticism and extinction may be rejected.

### DISCUSSION

This study found a conditioned GSR to be more quickly elicited and more resistant to extinction in introverts than in extraverts alcoholics.

Neuroticism scores were found to relate both to acquisition and to extinction measures. These relations were not predicted, and would appear to contradict other studies which found no correlations between neuroticism test scores and conditioning measures in samples of nonalcoholic normal and neurotic subjects (Franks, 1956; Franks, 1957). This pilot study only investigated GSR conditioning of alcoholic subjects so it is possible that the relations between neuroticism and conditioning, or between extraversion and conditioning may be peculiar only to an alcoholic group. Further research employing a control group of nonalcoholics would be required to evaluate the extent of the relation between extraversion scores and GSR conditioning.

Since the Hunt r amplifier employed in this study had a maximum measurable range of 43000 ohms, generalizations in this study are limited to alcoholics with a basal skin resistance of 43000 ohms or less. Since level of skin conductance has been reported to be, in part, dependent on temperature and humidity (Woodworth & Schlosberg, 1955, p. 143), it is possible that lower temperatures or decreased humidity may have raised some subjects' skin resistance beyond the



range measurable on this amplifier. It is not likely that the limitation of this study to subjects having skin resistance of 43000 ohms or less has introduced any systematic bias with regard to the personality factor examined in this experiment. A study of CSA conditioning would be improved, however, by employing an amplifier with a less restricted range of measurable skin resistance.

An investigation of the clinic files on those subjects who did not condition by 24 trials revealed no medical abnormalities which might account for the inadequate conditioning of the two extraversive subjects, but the introversive subject was reported to have a marked hearing defect. Since adequate hearing of the bell would be necessary in order to establish the conditioned response, this disability may have largely contributed to this subject's conditioning difficulty. While the majority of subjects who did not condition after maximum trials thus were found to be extraverts, and this result might be predicted from the hypothesis that extraversive subjects more slowly develop a conditioned response, no conclusions may be drawn from such a small number of cases.

Another reason for the apparent difficulty in establishing the conditioned response in some alcoholics may be suggested. Some evidence (Reese, Doss & Gantt, 1953) indicates that subjects with organic brain damage are more difficult to condition. It has frequently been observed that excessive use of alcohol over a long period of time is related to some organic cerebral impairment (Courville, 1955; Lemere, 1956). This raises the possibility that an alcoholic's failure to condition under the procedures of this study may relate to other evidences of organic



brain damage. Since this study only employed alcoholic subjects, further research with nonalcoholics would be required to determine if the observed rate of conditioning, and evidence of failure to condition is a peculiarity solely of alcoholic subjects.

#### CONCLUSION

Introversion-extraversion, as defined by test scores on the MPI, related to the ease with which alcoholics acquire and extinguish a conditioned GSR. In view of the theory (Eysenck, 1957) which relates this personality factor to general conditioning ability, it may be suggested that introversion-extraversion could also relate to ease of conditioning other autonomic responses in alcoholics.

Pilot study 1 observed a relation between introversion-extraversion and some drinking behaviour reported by alcoholics. The additional evidence obtained in this second exploratory study suggests that drinking behaviour reported by alcoholics may also distinguish alcoholics who would quickly acquire, and slowly extinguish a conditioned autonomic GSR. To the extent that alcohol drinking is a learned response which might be developed and extinguished according to conditioning principles, a relation between characteristic individual differences in conditioning ability and particular drinking behaviour may be useful information for both the prediction and the control of such behaviour in alcoholics.



## VI. FINAL STUDY

### The relation of alcohol drinking behaviour to GSR conditioning

#### INTRODUCTION

This study was designed to investigate hypotheses derived directly from the findings of the preliminary studies. "Introversion," as defined by smaller E scale scores on the Maudsley Personality Inventory (MPI), was significantly related to alcoholics' reports of a steady drinking pattern, of solitary drinking and of a longer time between occurrence of first blackout and onset of frequent blackouts. "Extraversion," defined by larger E scale scores, was found to relate to reports of a periodic drinking pattern, of no solitary drinking and of a shorter time between first blackout and onset of frequent blackouts. The second pilot study found a relation between alcoholics' E scale scores and their conditioning behaviour. Smaller E scale scores were related to faster acquisition and slower extinction of the conditioned GSR. These observations led to the suggestion that the particular drinking behaviour which an alcoholic reports may relate to the ease with which he establishes and extinguishes a conditioned GSR. In order to examine this possibility, the following hypotheses were investigated:

- (1) A conditioned GSR will be established in fewer trials and will be more resistant to extinction in alcoholics reporting solitary drinking than in those reporting never drinking solitarily.



(2) A conditioned GSR will be established in fewer trials and will be more resistant to extinction in alcoholics reporting a longer time between the first blackout and the increasing frequency of these blackouts, than in those reporting a shorter time between these events.

(3) A conditioned GSR will be established in fewer trials and will be more resistant to extinction in alcoholics reporting a steady drinking pattern than in those reporting a periodic drinking pattern.

The preliminary study of GSR conditioning found speed of acquisition and extinction of the conditioned response to relate to extraversion test scores. These measures of conditioning were observed also to relate to neuroticism scores. Since the extraversion and neuroticism variables are considered to be independent, and extraversion is assumed to be the factor relevant to conditioning behaviour (Eysenck, 1957), the evidence of a relation between neuroticism and GSR conditioning in alcoholics apparently contradicts this assumption. The results of the pilot study also are counter to evidence from other studies which found no significant relation between neuroticism and conditioned eyeblinking in nonalcoholic normals and neurotics (Franks, 1956; Franks, 1957). There has been no research specifically designed to compare acquisition and extinction of a conditioned GSR in alcoholic and non-alcoholic subjects in relation to introversion-extraversion or to neuroticism. It could be suggested that the correlations observed in the pilot study between conditioning measures and the extraversion or the neuroticism scores may be peculiar solely to an alcoholic group. To investigate this possibility, GSR conditioning scores were obtained from a control group of nonalcoholic normal subjects (i.e. not hospital-



ized for alcoholism or other psychiatric disorder). In order to examine conditioning scores solely in relation to extraversion scores in the alcoholic and nonalcoholic group, covariance analyses were employed. This permitted statistical control of any possible influence of differing neuroticism scores on measures of conditioning. The following hypothesis was presented:

(4) When provision is made to control differences in neuroticism in an alcoholic and nonalcoholic group, the conditioned GSR will be elicited in fewer trials and will be more resistant to extinction in **introversive**, than in extraversive subjects.

Preliminary study 2 found that a few alcoholics did not display the conditioned GSR response within the maximum number of conditioning trials. In accord with the finding that extraversion was related to more trials to condition (i.e. slower acquisition of the conditioned GSR), it was hypothesized:

(5) A significant predominance of extraversive alcoholics and nonalcoholics will be obtained among those subjects not displaying the conditioned GSR within the maximum number of acquisition trials.

Some investigators (Winokur, Guze, Stewart, Pfeiffer, Stern, Fornung, 1959) have employed measures of GSR latency to assess subjects' "reactivity" or "adaptation" to stimuli. This measure has also been used to identify conditioned and unconditioned GSR responses. Franks (1956) noted that GSR adaptation appeared to occur faster among more extraversive subjects. From a casual inspection of the GSR conditioning record charts obtained in the second pilot study, it appeared that some alcoholics responded more quickly to the experimental stimuli than did



others, and this difference seemed to be fairly constant throughout a subject's record. Since introversive and extraversive subjects are predicted to differ in their GSR conditioning behaviour, it seemed possible that these subjects might also differ systematically in conditioned and unconditioned GSR latency. Preliminary study 2 found a relation between neuroticism measures and conditioning scores. This raised the possibility that neuroticism scores also might relate to latency measures. In order to explore the relation between extraversion and GSR latency, statistical control for different neuroticism scores in the alcoholic and nonalcoholic group was employed, and the following predictions were made for both groups:

- (6) The latency of the conditioned and the unconditioned GSR will differ in introversive subjects as compared with extraversive subjects.
- (7) The changes in unconditioned GSR latency, which occur during conditioning trials, will differ in introversive subjects as compared with extraversive subjects.

#### METHOD

Apparatus With the exception of the Hunter Model 300 GSR amplifier, the equipment used in the conditioning procedure of this study was identical to that described in the second pilot study. The Hunter amplifier was replaced by a Lafayette 601-A GSR amplifier which extended the measurable range of skin conductance to 100,000 ohms. Since this upper limit is much beyond the usual skin resistance measures obtained



from humans, the use of the Lafayette model avoided loss of any subjects with unusually high basal skin resistance. Stainless steel finger electrodes from the Lafayette amplifier were attached to a subject's left hand. In all other important respects, the Hunter and Lafayette GSR amplifiers were identical.

Measures Information on alcoholics' drinking behaviour, and on introversion-extraversion was obtained from a research questionnaire. A description of this test, and the scoring procedure are presented in chapter IV. This chapter also describes the GSR conditioning technique and the measures of 1) trials to acquire the conditioned response, and 2) conditioned responses in 10 extinction trials.

In the second pilot study, the conditioned response was seldom observed after 7 of the 10 extinction trials. An occasional subject, however, displayed conditioned responses as long as these trials continued. In order to investigate resistance to extinction more fully, an additional measure was employed in this experiment. "Extinction" was considered to occur when three consecutive presentations of the unreinforced conditioned stimulus failed to elicit a conditioned GSR. A conditioned response was again defined as a pen deflection above zero base line which accompanied the presentation of the unreinforced LAJ syllable, and which was larger than any pen deflection occurring in the subject's chart to the intervening buffer syllables. A subject's score was the number of unreinforced conditioned stimuli presented to him prior to extinction. A greater number of presentations indicated greater resistance to extinction. This measure was obtained by merely continuing



the presentations of the unreinforced LAJ syllable until the defined extinction pattern was observed in the subject's record chart. In most cases this occurred by the time the 10 standard extinction trials were completed. No other changes in the conditioning procedure were introduced in this study.

A measure of conditioned and unconditioned response latency was obtained on each alcoholic and nonalcoholic subject. "Latency" was defined as the time between the presentation of the experimental stimulus and the maximum amplitude change in GSR. From the observations obtained in study 2, this latency appeared to vary from two to five seconds. Shorter latency may be considered to indicate a faster response. The moment of presentation of both the conditioned and the unconditioned stimulus was automatically marked on the subject's record chart by a side pen. Figure 2 is an enlarged sketch of a GSR record

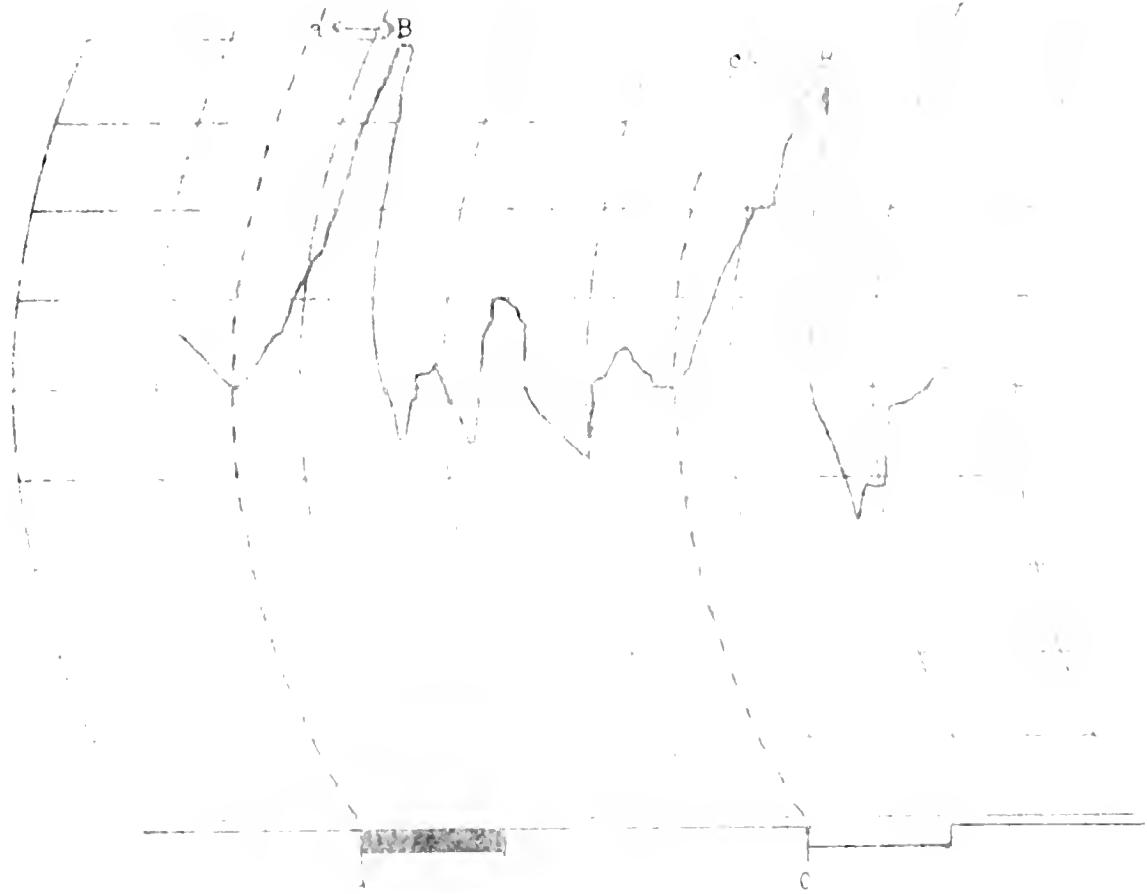
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FIGURE 2

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illustrating measurement of latency. The record is read from left to right, so that the first lowered deflection of the side pen indicates the moment of stimulus presentation. Point "A" in Figure 2 marks the occurrence of the bell (US); "C" indicates the presentation of the unreinforced LAJ (CS). "B" is the point of maximum GSR amplitude to each stimulus. The distance between the side pen mark indicating the moment of stimulus presentation, and the point of maximum pen deflection could be measured. This is indicated by "a-B" or "c-B". The record chart moved at a constant speed of three inches per minute. The obtained





Enlarged sketch of GSR latency measurement. Point "B" is the maximum amplitude of the GSR response. "a" and "b" indicate the moment of onset of the unconditioned bell stimulus. "c" and "d" mark the presentation of the conditioned stimulus. Distances "a-B" and "c-B" were converted to time units to yield a measure of the unconditioned and conditioned GSR latency respectively.

FIGURE 2

Enlarged sketch of GSR latency measurement



measure was converted to time units with an accuracy of .25 of a second. This degree of precision was considered to be adequate in view of the relatively large latency of a GSR (two to five seconds), and the slow chart speed which delivered fairly condensed records (cf. Figure 1) on which more precise measurement was exceedingly difficult.

In order to obtain latency measures of 1) conditioned GSR, 2) initial unconditioned GSR, and 3) "adaptation" or change in unconditioned GSR occurring over the conditioning trials, four measures were computed from each subject's chart as follows:

(1) The average latency of the three conditioned responses displayed during the conditioning pattern was employed as an index of the speed of the conditioned response. This measure is symbolized as CR.

(2) The average latency of the first three unconditioned responses elicited by the bell stimulus was taken as an index of the initial speed of the unconditioned response. This measure is identified as  $UR_1$ .

(3) The average latency of the three unconditioned responses displayed during the conditioning pattern was employed as an index of the speed of the unconditioned response when the conditioned response was established.  $UR_2$  represents this measure symbolically.

(4) The difference between a subject's initial unconditioned response latency ( $UR_1$ ) and the latency of his unconditioned response during the conditioning pattern ( $UR_2$ ) was computed ( $UR_1 - UR_2$ ) to give a measure of change in GSR response latency to the bell. A negative score value thus indicates that the response to the bell became slower as conditioning trials continued; a positive score reveals the converse



(i.e. the subject's response was faster when the conditioned response was established.)

Procedure The alcoholic subjects completed a research questionnaire (Appendix A) in group or individual testing sessions comparable to those described in the pilot studies. A questionnaire which only contained the MPI (Appendix A, pp. 4-6) was administered to nonalcoholics under similar test conditions. All subjects were tested individually for GSR conditioning. The procedure for conditioning was identical to that employed in study 2. The questionnaire and the conditioning measures are described in chapter IV of this thesis. The same instructions (Appendix B) were given to all subjects.

Subjects A sample of 59 male alcoholics who were not under tranquillizing or other sedative drug therapy was obtained from the in-patients of Brookside alcoholism clinic. The severe language difficulties of four of these subjects made it impossible for them to complete the paper and pencil questionnaire. Power failures and similar unavoidable interruptions during the conditioning procedure resulted in the loss of five subjects. Two subjects were inadvertently discharged from hospital before their testing was completed. There is no reason to suspect that the loss of subjects due to the above mentioned difficulties introduced any systematic bias in the sample with regard to the experimental variables. Eight subjects who failed to display the conditioning pattern in the maximum number of 24 trials were grouped together for separate investigation with regard to one of the experimental hypotheses.



Complete questionnaire and conditioning data were obtained on 40 alcoholics. The ages of these subjects ranged from 27 to 57, with a mean of 40.67 years. Twenty cases had extraversion scores of less than 25, while the remaining 20 alcoholics had scores of 25 and larger. In the sample of 40 cases, the mean and standard deviation of the extraversion scores was 20.98, S.D. = 9.42. The mean neuroticism score was 35.85 with a S.D. of 11.19.

The nonalcoholic control group was obtained from adult male volunteers who were not hospitalized for alcoholism. The majority of these subjects were obtained from a first year University of Toronto summer school course in anthropology. Volunteers were obtained also from a second year experimental psychology course at the University of Toronto, and from the Ontario College of Education teacher's summer school course. Additional volunteers were obtained among professional and technical personnel who visited the building where the experiment was being conducted. The resulting sample contained teachers, electricians, telephone and hydro repair men, a janitor, two physicians, a pharmacologist, two graduate students in psychology, and a number of university undergraduate summer students who were employed in various other occupations for most of the year. Prior to testing, no subjects were familiar with the apparatus or the experimental procedure, and they were not informed that the experiment involved conditioning principles.

Of the 43 volunteers tested, two cases could not be employed because of unavoidable interruptions during the conditioning procedure. One normal subject did not display GSR conditioning in the maximum



number of acquisition trials. This case was grouped with other subjects who did not condition.

In order to have comparable extraversion scores in the control and the alcoholic group, nonalcoholic subjects were tested until 20 subjects with extraversion test scores under 25 and 20 with scores of 25 and over were obtained. The nonalcoholic group therefore contained the first 20 subjects who were obtained in each category. Ages in the nonalcoholic sample ranged from 21 to 46, with a mean of 29.63 years. The mean extraversion score was 23.77, S.D. = 9.42; the mean neuroticism score was 20.98, S.D. = 11.59.

### RESULTS

In order to investigate the relation between drinking behaviour and conditioning scores, the alcoholic group was first examined for the incidence of these reported behaviours. Twenty-seven subjects reported solitary drinking as compared with 13 alcoholics who stated that they never drank solitarily. The difference between ages reported at first alcoholic blackout and at onset of frequent blackouts ranged from 0 to 23.5, with a median of 2.5. Eighteen alcoholics reported a steady drinking pattern while 22 subjects reported periodic drinking. The median reported absolute alcohol consumption in a drinking day was 10.8 oz. for the steady drinkers, and 17.6 oz. for the periodic drinkers. The overall median daily absolute alcohol consumption was 14.85 oz.

On the basis of the findings in preliminary study 1, it seemed possible that these drinking behaviours might be interdependent. For



example, the subject reporting steady drinking might also be likely to report solitary drinking and a larger difference between ages at first blackout and at onset of frequent blackouts. This in turn raised the possibility that the observed conditioning scores might depend on the particular combination of behaviours reported (i.e. an interaction effect). In order to investigate this possibility, a  $2 \times 2 \times 2$  variance analysis (Lindquist, 1953) was conducted using the three behaviour variables dichotomized in the following manner:

- A. Steady vs periodic drinking
- B. Solitary vs no solitary drinking
- C. 2 years and less between ages at first and at onset of frequent blackouts vs a difference  $> 2$ .<sup>6</sup>

Appendix C presents the number of subjects contained in the resulting eight classifications. It can be seen that the number of cases in these categories ranges from two to eight. The three way analysis of variance presented by Lindquist requires an equal number of cases in all cells. Since one of the categories contained only two subjects, a random selection of two cases was made from each category having  $n > 2$  (see Appendix C). The resulting total number of cases employed for an analysis was 16.<sup>7</sup>

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- 6. The median score of 2.5 was employed to dichotomize the group.
- 7. The writer is grateful for the advice and assistance of Dr. D. A. Sprott, Associate Professor, Department of Mathematics, Waterloo University, Ontario. He performed a non-orthogonal analysis of variance (Kendall, 1955) on one of the conditioning measures. This analysis, on the assumption of no interaction, employs the full sample and corrects for unequal cases in a cell. The results of his analysis reached a higher level of significance but were otherwise identical to the  $2 \times 2 \times 2$  analysis presented in this thesis.



Table 12 presents the  $2 \times 2 \times 2$  analysis of variance of the

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TABLE 12

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trials to acquire the conditioned GSR in the alcoholic groups. Similar analyses for the two measures of extinction are presented in Tables 13 and 14. In view of the identical findings in all three tables, their

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TABLES 13 and 14

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results may be considered jointly. No significant first or second order interaction effects are observed in the analysis of any of the three conditioning measures. Only one significant main effect is observed in each analysis, and in each case this is the effect attributable to steady vs periodic drinking. Alcoholics reporting steady drinking differed from those reporting periodic drinking on all of the following measures: (a) trials to acquire the conditioned GSR; (b) conditioned GSR's in 10 extinction trials; and (c) conditioned GSR's prior to extinction.

Since these three analyses consistently failed to indicate any significant interaction effects among the drinking behaviour variables, it might be assumed that these interaction effects are at least negligible. On this assumption, a separate investigation of each of the behaviour variables was conducted employing the entire sample ( $n = 40$ ).

Table 15 presents the results of t-tests of differences in

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TABLE 15

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TABLE 12

Variance analysis of trials to acquire a conditioned GSR response as a function of three alcohol drinking behaviour variables

Source	df	Sum of squares	Mean squares	F
A. Steady vs periodic drinking	1	324.00	324.00	32.40*
B. Solitary vs no solitary drinking	1	1.00	1.00	0.10
C. Difference of 2 years or less between ages of first and frequent blackouts vs a difference > 2	1	2.25	2.25	0.23
AB interaction	1	20.25	20.25	2.05
AC interaction	1	1.00	1.00	0.10
BC interaction	1	1.00	1.00	0.10
ABC interaction	1	0.25	0.25	0.03
Within cells	8	80.00	10.00	
Total	15	429.75		

\* with 1 and 8 d.f.; p < .01



TABLE 13

Variance analysis of the number of conditioned GSR responses in 10 extinction trials as a function of three alcohol drinking behaviour variables

Source	df	Sum of squares	Mean squares	F
A. Steady vs periodic drinking	1	33.07	33.07	11.25*
B. Solitary vs no solitary drinking	1	5.07	5.07	1.72
C. Difference of 2 or less between ages of first and frequent blackouts vs a difference > 2	1	0.07	0.07	0.02
AB interaction	1	7.55	7.55	2.57
AC interaction	1	0.05	0.05	0.02
BC interaction	1	7.55	7.55	2.57
ABC interaction	1	0.08	0.08	0.03
Within cells	8	23.50	2.94	
Total	15	76.94		

\* with 1 and 8 d.f.;  $p < .05$



TABLE 14

Variance analysis of the number of conditioned GSR responses prior to extinction as a function of three alcohol drinking behaviour variables

Source	df	Sum of squares	Mean squares	F
A. Steady vs periodic drinking	1	90.25	90.25	6.33*
B. Solitary vs no solitary drinking	1	4.00	4.00	0.28
C. Difference of 2 or less between ages of first and frequent blackouts vs a difference > 2	1	1.00	1.00	0.07
AB interaction	1	30.25	30.25	2.12
AC interaction	1	6.25	6.25	0.44
BC interaction	1	0.00	0.00	0.00
ABC interaction	1	0.25	0.25	0.02
Within cells	8	114.00	14.25	
Total	15	246.00		

\* with 1 and 8 d.f.;  $p < .05$



TABLE 15

GSR conditioning scores among alcoholics reporting drinking solitarily compared with those reporting no solitary drinking.

Alcoholic Group	n	Trials to acquire a conditioned GSR	Conditioned GSR's observed in 10 extinction trials			Conditioned GSR's observed prior to extinction		
			<u>Mean</u>	<u>SD</u>	<u>t</u>	<u>Mean</u>	<u>SD</u>	<u>t</u>
Drink solitarily	27	10.26	5.15		4.26	2.10	5.93	5.04
Never drink solitarily	13	10.08	5.23		4.39	2.24	6.15	3.51

with 38 df,  $t = 2.03$  for  $p < .05$



conditioning scores between subjects reporting solitary drinking and those never drinking solitarily. Even when the entire sample is employed, the null hypothesis regarding the relation of reported solitary drinking to conditioning behaviour may not be rejected. Acquisition and extinction measures of the conditioned response do not differ in the group of alcoholics reporting solitary drinking as compared with those reporting no solitary drinking.

The median score of 2.5 for the difference between ages reported for first blackout and for onset of frequent blackouts was again employed to dichotomize the sample into two equal groups. t-tests of differences between these two groups on the three conditioning measures are summarized in Table 16. No significant differences between the groups are obtained

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TABLE 16

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for any of the measures. Both groups are found to acquire and to extinguish the conditioned GSR in a similar number of trials. These results are consistent with the analyses summarized in Tables 12, 13 and 14 which also found no significant effects attributable to reported blackouts.

Table 17 presents the results of t-tests of differences in

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TABLE 17

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conditioning scores between alcoholics reporting steady drinking and those reporting periodic drinking. These two groups differ significantly on all of the conditioning measures. This evidence agrees both with the



TABLE 16

GSR conditioning scores among alcoholics obtaining a difference score of 2 or less between ages reported for first and for onset of frequent blackouts, compared with alcoholics having a difference score > 2

Alcoholic Group	n	Trials to acquire a conditioned GSR	Conditioned GSR's observed in 10 extinction trials			Conditioned GSR's observed prior to extinction		
			Mean	SD	t	Mean	SD	t
Difference score of 2 or less	20	11.4	5.32	4.2	2.42	5.05	4.04	
Difference score > 2	20	9.0	4.73	4.4	1.83	7.00	4.90	1.37

with 38 df,  $t = 2.03$  for  $p < .05$



TABLE 17

GSR conditioning scores among alcoholics reporting steady drinking compared with those reporting periodic drinking.

Alcoholic Group	n	Trials to acquire a conditioned GSR			Conditioned GSR's observed in 10 extinction trials			Conditioned GSR's observed prior to extinction		
		Mean	SD	$t$	Mean	SD	$t$	Mean	SD	$t$
Steady drinking	18	5.9	2.44		5.6	1.5		8.7	4.62	
				6.90*			3.97*			3.86*
Periodic drinking	22	13.7	4.12		3.3	2.05		3.8	3.19	

\* with 38 df,  $p < .01$



analyses summarized in Tables 12, 13 and 14, and with the experimental hypothesis. Group mean scores on these three measures are presented in Figure 3. The conditioned GSR is elicited in fewer trials and is more

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FIGURE 3

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resistant to extinction in alcoholics reporting steady drinking than in those reporting periodic drinking.

In order to examine the conditioning scores of alcoholic and non-alcoholic subjects in relation to extraversion scores, a 2 x 2 analysis of covariance was performed. This analysis was employed to control and adjust these measures for any possible influence due to neuroticism (N) score differences in these two groups. In line with the procedures reported in the pilot studies, subjects were dichotomized into introversive and extraversive categories.

Figure 4 presents the mean trials to condition in alcoholic and

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FIGURE 4

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nonalcoholic groups of introversive and of extraversive subjects. The covariance analysis of trials to acquire the conditioned GSR is summarized in Table 18. No significant interaction effects are observed.

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TABLE 18

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The alcoholic and nonalcoholic groups do not differ in the number of acquisition trials. The significant effect for personality (extraversion)



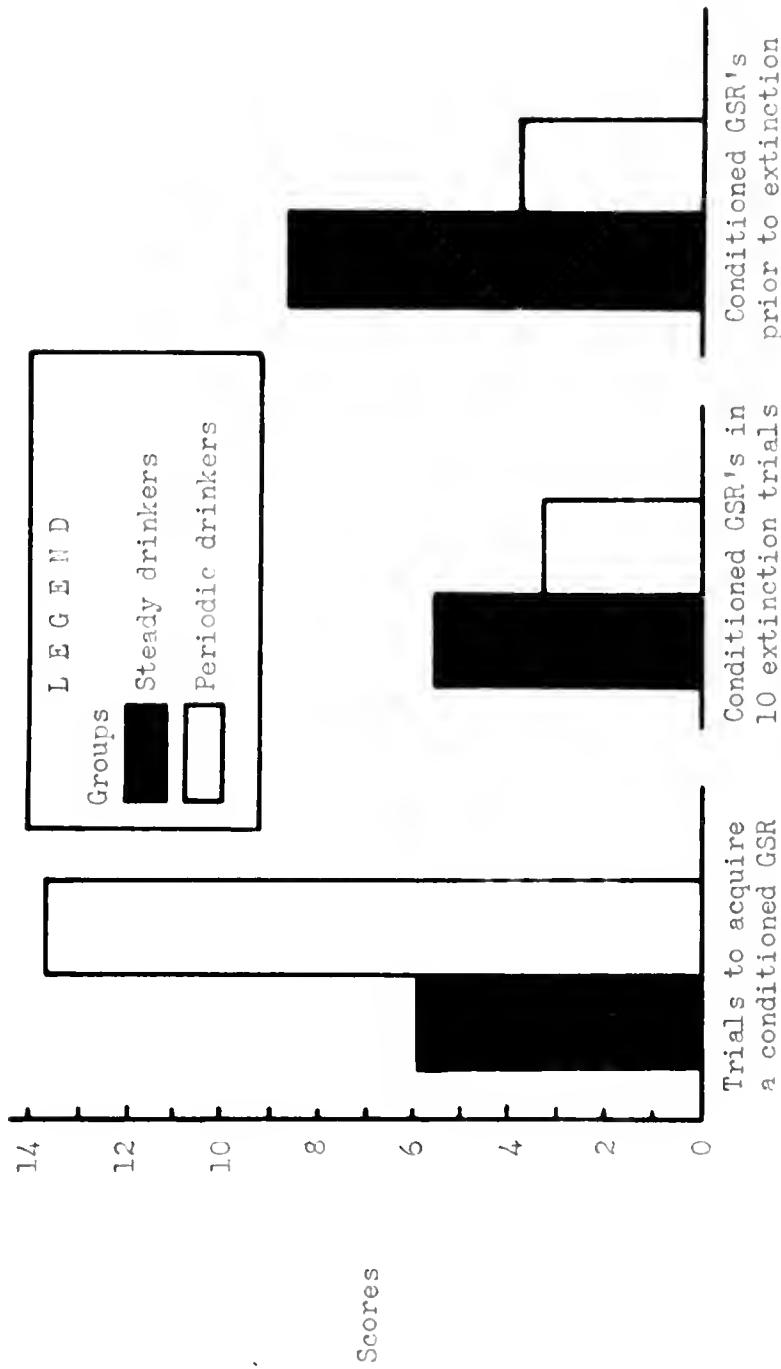


FIGURE 2



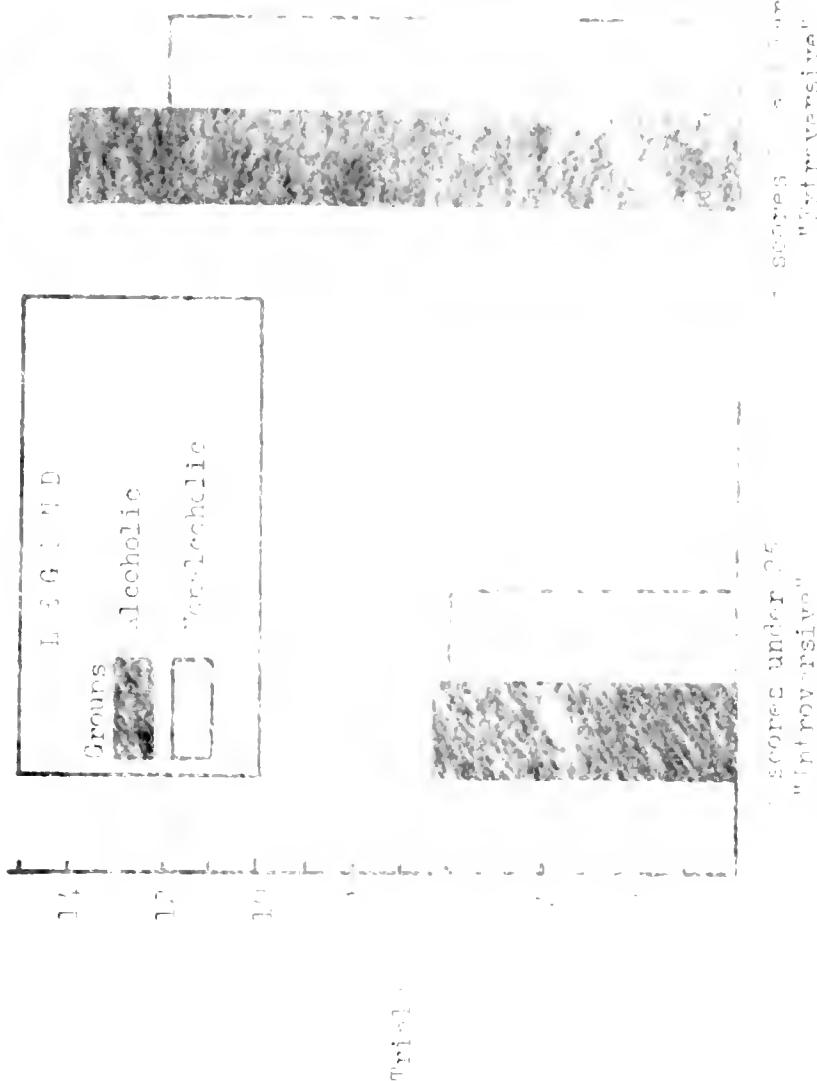


FIGURE 1

non trials to require the conditioned cue for higher and lower score subjects in an alcoholic and a nonalcoholic group



TABLE 18

Group x Personality covariance analysis of trials to acquire a conditioned GSR with N scores of the MPI as covariant

Source	df	Sum of squares X	Sum of squares XY	Sum of squares Y	Adjusted sum of squares Y'	df	Mean squares Y'	F
Group	1	4,425.3	364.4	30.0	7.9	1	7.9	0.65
Personality	1	475.3	-675.1	959.1	950.8	1	950.8	78.58*
Group x Personality interaction	1	678.7	-102.0	15.4	20.7	1	20.7	1.71
Within cells	76	9,050.1	276.3	916.9	908.5	75	12.1	
Total	79	14,629.4	-136.4	1,921.4				

\* with 1 and 75 df,  $p < .01$



indicates that introversive subjects in alcoholic and nonalcoholic groups displayed the conditioned response in fewer trials than did the extraversive subjects in these groups ( $F = 73.58$ , 1 and 75 df,  $p < .01$ ). The unadjusted score values in Table 18 show that similar results are obtained if the scores are not adjusted for the subjects' differing N scores.

Table 19 summarizes the covariance analysis of number of

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TABLE 19

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conditioned GSR's observed during 10 extinction trials. The mean scores of alcoholic and nonalcoholic groups of introversive and extraversive subjects are presented in Figure 5. No significant interaction effect

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FIGURE 5

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is observed. Alcoholics and nonalcoholics do not differ significantly in the number of conditioned GSR's displayed in 10 extinction trials. The significant effect for personality ( $F = 43.56$ , 1 and 75 df,  $p < .01$ ) indicates that introversive alcoholics and nonalcoholics displayed more conditioned responses during 10 extinction trials than did extraversive subjects.

The covariance analysis of number of conditioned GSR's observed prior to extinction is summarized in Table 20. The only significant

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TABLE 20

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TABLE 19

Group x Personality covariance analysis of number of conditioned GSR's observed during 10 extinction trials with N scale scores of the NPI as covariant

Source	df	Sum of squares X	Sum of squares YY	Sum of squares Y	Adjusted sum of squares Y'	df	Mean squares Y'	F
Group	1	4,425.3	- 81.8	1.5	0.7	1	0.7	0.21
Personality	1	475.3	256.0	137.8	148.1	1	148.1	43.56*
Group x Personality interaction	1	678.7	- 90.3	12.1	6.2	1	6.2	1.80
Within cells	76	9,050.1	-309.8	266.6	256.0	75	3.4	
Total	79	14,629.4	-225.9	418.0				

\* with 1 and 75 df,  $p < .01$





FIGURE 5

Mean number of conditioned stimuli in a test trial for higher and lower severe epileptic patients in a non-echoic group



TABLE 20

Group x Personality covariance analysis of number of conditioned GSR's observed prior to extinction with N scale scores on the MPI as covariant

Source	df	Sum of squares X	Sum of squares XY	Sum of squares Y	Adjusted sum of squares Y <sup>1</sup>	df	Mean squares Y <sup>1</sup>	F
Group	1	4,425.3	- 29.75	0.21	8.15	1	8.15	0.545
Personality	1	475.3	507.00	540.80	572.33	1	572.33	38.33*
Group x Personality interaction	1	678.7	29.12	1.24	6.61	1	6.61	0.442
Within cells	76	9,050.1	- 534.85	1,151.30	1,119.69	75	14.93	
Total	79	14,629.4	- 28.48	1,693.55				

\* with 1 and 75 df, p < .01



effect observed is that attributable to personality ( $F = 38.33$ , 1 and 75 df,  $p < .01$ ). Figure 6 indicates that introversive subjects displayed

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FIGURE 6

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more conditioned responses prior to extinction than did extraversive subjects. The conditioned GSR was more resistant to extinction in alcoholic and nonalcoholic subjects having introversive test scores than in those having extraversive scores. The covariance summary table indicates that essentially similar results are obtained if the scores are not adjusted for differing  $N$  scores in the groups.

An examination of extraversion scores obtained in the group of subjects who did not display the criterion of conditioning in the maximum number of acquisition trials revealed a striking agreement with the experimental hypothesis. These findings, summarized in Table 21,

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TABLE 21

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require no statistical evaluation to indicate that the conditioned GSR is more difficult to elicit in subjects having extraversive test scores.

Measures of conditioned and unconditioned GSR response latencies were obtained from alcoholic and nonalcoholic subjects in order to examine the relation of these measures to introversion-extraversion. Since the results in pilot study 2 raised the possibility that GSR conditioning might be partly related to neuroticism ( $N$ ) scores on the NPI, covariance analyses were also performed on these latency measures. Statistical control of any possible variability in latency measures due



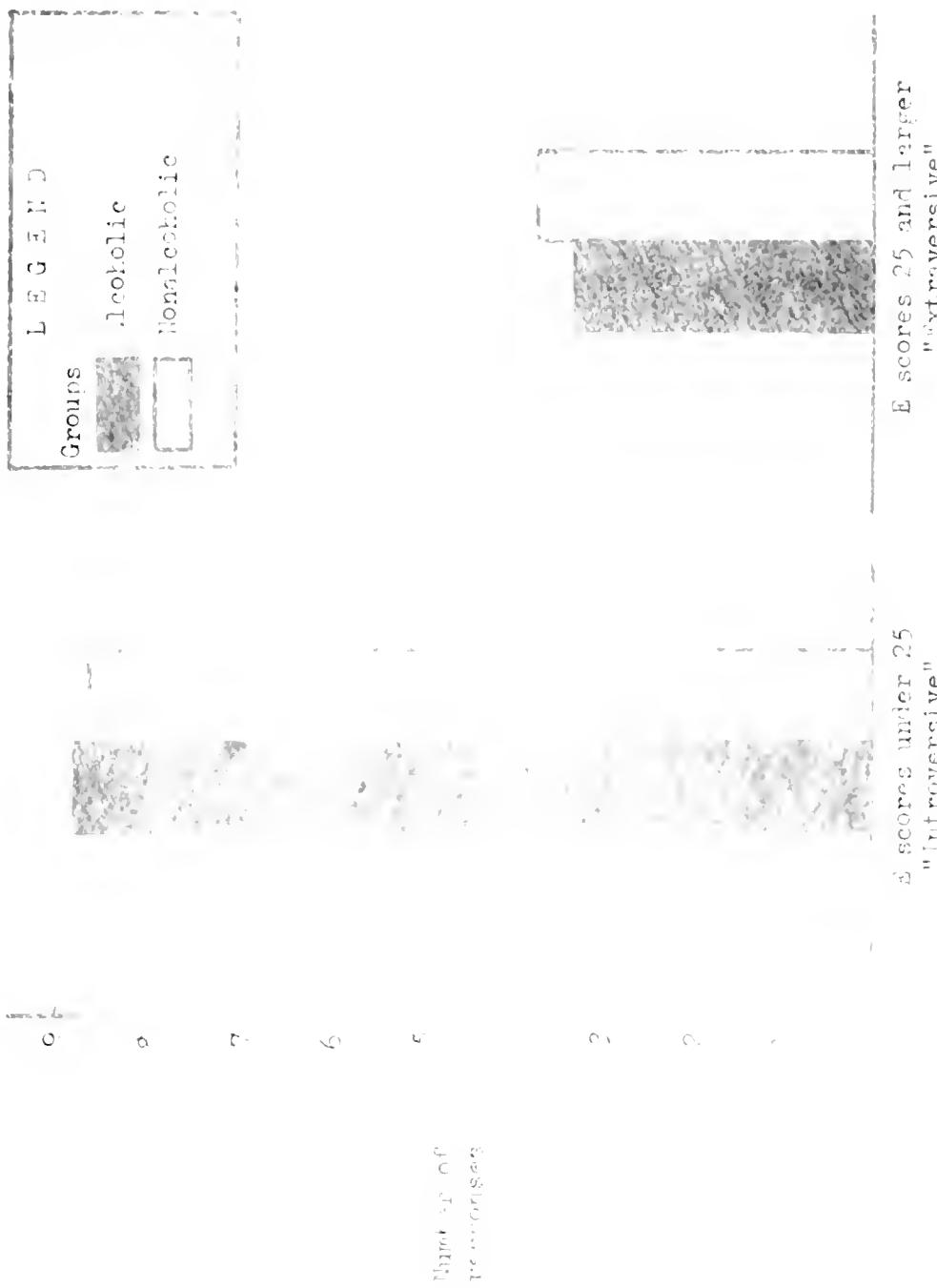


FIGURE 6

Figure 6. Number of conditioned GSR's prior to extinction for lighter and heavier E score subjects in an alcoholic and a nonalcoholic group.



TABLE 21

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Alcoholic and nonalcoholic subjects failing to display the conditioning criterion in 24 trials

<u>Subjects</u>	<u>E score under 25</u>	<u>E score 25 and over</u>
Alcoholics	0	8
Nonalcoholics	0	1

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to differing  $\Sigma$  scores permitted an examination of latency in relation to the variable of extraversion.

A summary of the covariance analysis of conditioned response (CR) latency is shown in Table 22. A significant interaction effect

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TABLE 22

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is obtained between group and personality variables ( $F = 4.08$ , with 1 and 75 df,  $p < .05$ ). It may be noted that similar results are obtained if the unadjusted scores are employed in the analysis. Figure 7, which

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FIGURE 7

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presents mean CR latency for the four groups, indicates that extraversive scores in the alcoholic group are associated with a faster conditioned GSR (i.e. one having shorter latency). Among the nonalcoholics, however, extraversive scores are associated with a slower CR.

Table 23 summarizes the covariance analysis of initial uncon-

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TABLE 23

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ditioned GSR latency. The only significant effect observed is that related to personality ( $F = 4.36$ , with 1 and 75 df,  $p < .05$ ). It may be seen (Figure 8) that this response is slowest (i.e. longest

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FIGURE 8

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latency) in introulsive subjects, and fastest in extraversive individuals.



TABLE 22

Group x Personality covariance analysis of conditioned GSR latency with N scale on the MPI as covariant

Source	df	Sum of squares X	Sum of squares XY	Sum of squares Y	Adjusted sum of squares Y <sup>1</sup>	df	Mean squares Y <sup>1</sup>	F
Group	1	4,425.3	53.20	0.637	.004	1	.004	><
Personality	1	475.3	-12.83	0.343	.653	1	.653	><
Group x Personality interaction	1	678.7	57.55	4.875	3.425	1	3.425	4.08*
Within cells	76	9,050.1	100.88	64.181	63.057	75	0.840	
Total	79	14,629.4	198.80	70.036				

\* with 1 and 75 df,  $p < .05$

>< not tested or evaluated because of significant interaction effect



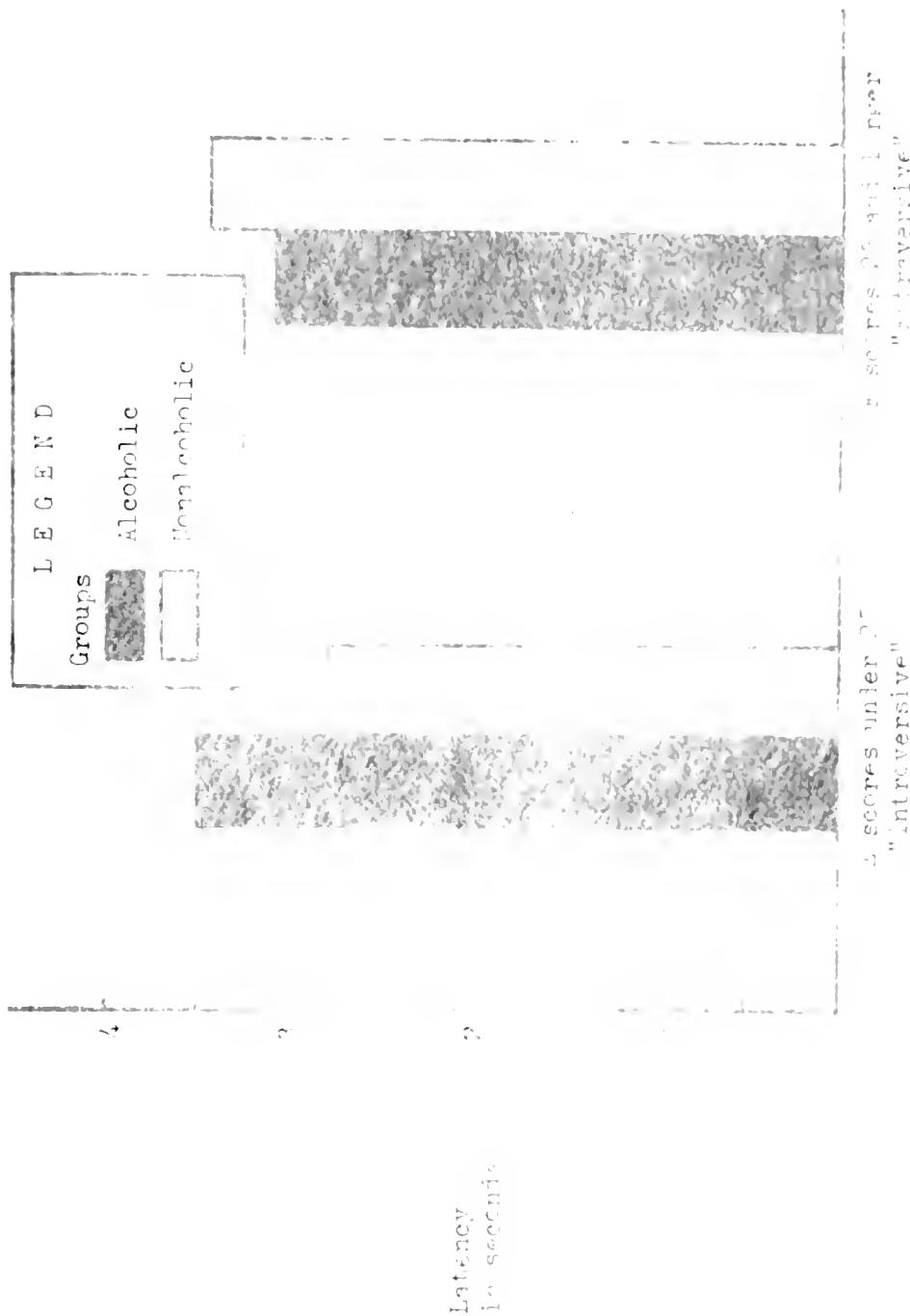


FIGURE 7

"Mean latency of conditioned Götts for higher and lower scores subjects in an alcoholic and a nonalcoholic group."



TABLE 23

Group x Personality covariance analysis of initial unconditioned GSR latency with N scale scores on the MPI as covariant

Source	df	Sum of squares X	Sum of squares XY	Sum of squares Y	Adjusted sum of squares Y'	df	Mean squares Y'	F
Group	1	4,425.3	-3.422	.003	0.160	1	0.160	.224
Personality	1	475.3	42.461	3.793	3.094	1	3.094	4.358*
Group x Personality interaction	1	678.7	47.183	3.280	2.503	1	2.503	3.525
Within cells	76	9,050.1	59.322	53.644	53.255	75	0.710	
Totals	79	14,629.4	145.544	60.720				

\* with 1 and 75 df,  $p < .05$



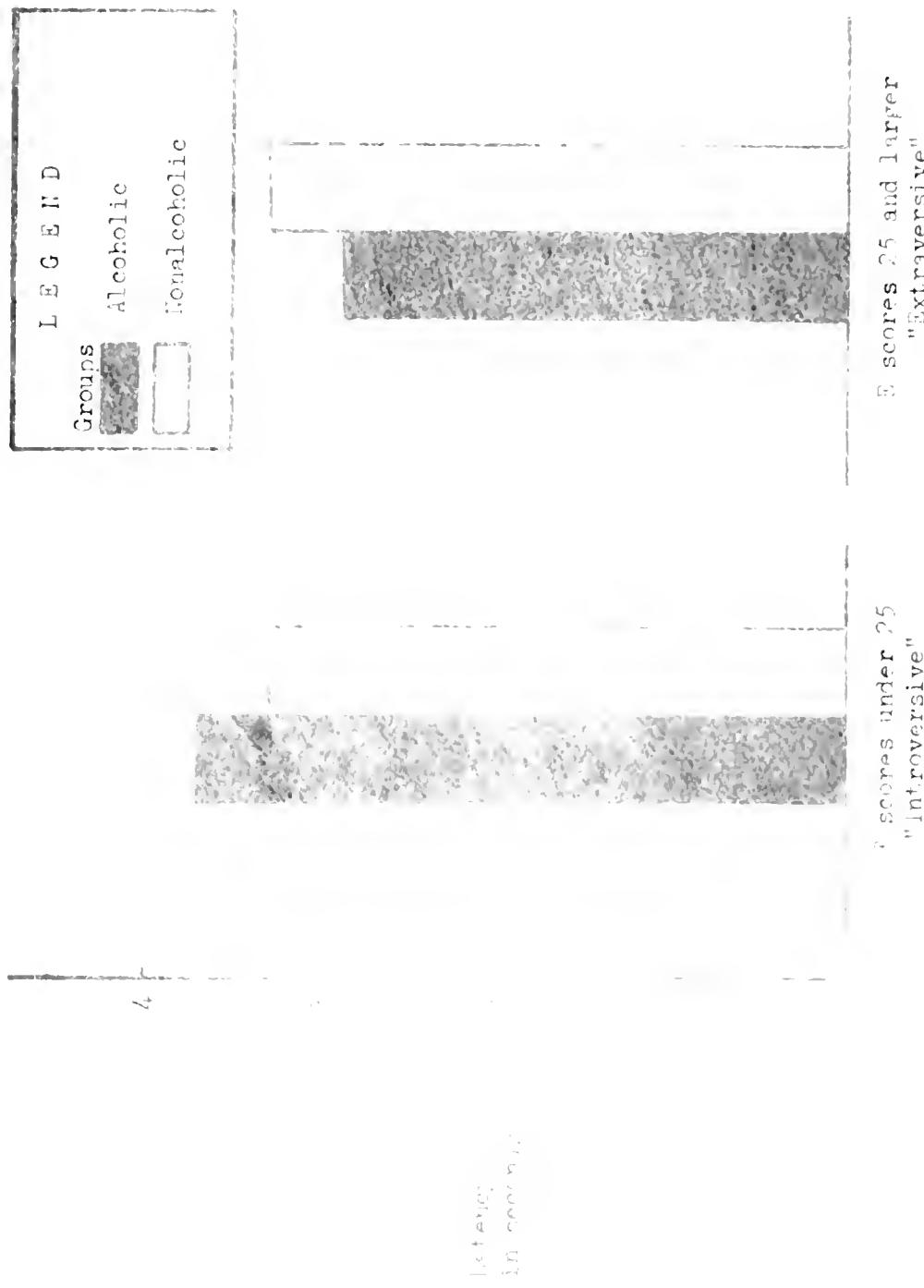


FIGURE 2

Mean latency of unconditioned GSR for higher and lower score subjects in an alcoholic and a nonalcoholic group



In order to examine "adaptation" or change in unconditioned GSR latency which occurs during the conditioning procedure, the average latency of a subject's unconditioned responses during the conditioning pattern ( $UR_2$ ) was subtracted from the average latency of his initial unconditioned responses ( $UR_1$ ). A negative value thus obtained indicates that the unconditioned GSR's displayed during the conditioning pattern were slower (i.e. had a longer latency) than the initial unconditioned GSR's. A positive score, on the other hand, indicates that the unconditioned GSR's displayed during the conditioning pattern were faster than the initial unconditioned GSR's. A co-variance analysis of these measures is summarized in Table 24. No significant interaction

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TABLE 24

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effect is observed, but a significant effect for personality ( $F = 6.67$ , 1 and 75 df,  $p < .05$ ), and for groups ( $F = 5.036$ , 1 and 75 df,  $p < .05$ ) is obtained. Figure 9 presents mean change in unconditioned GSR latency

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FIGURE 9

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for introversive and extraversive subjects in alcoholic and nonalcoholic groups. The unconditioned GSR tends to be slower when conditioning is established. This tendency is more pronounced in alcoholics as compared with nonalcoholics, and is displayed by extraversive subjects rather than introversive individuals.



TABLE 24

Group x Personality covariance analysis of change in unconditioned GSR latency during conditioning with N scale scores on the MPI as covariant

Source	df	Sum of squares X	Sum of squares XY	Sum of squares Y	Adjusted sum of squares Y'	df	Mean squares Y'	F
Group	1	4,425.3	- 69.466	1.090	3.535	1	3.535	5.036*
Personality	1	475.3	57.330	6.915	4.683	1	4.683	6.670*
Group x Personality interaction	1	678.7	- 1.864	0.005	0.288	1	0.288	0.410
Within cells	76	9,050.1	170.046	55.876	52.681	75	0.702	
Total	79	14,629.4	156.046	63.886				

\* with 1 and 75 df,  $p < .05$



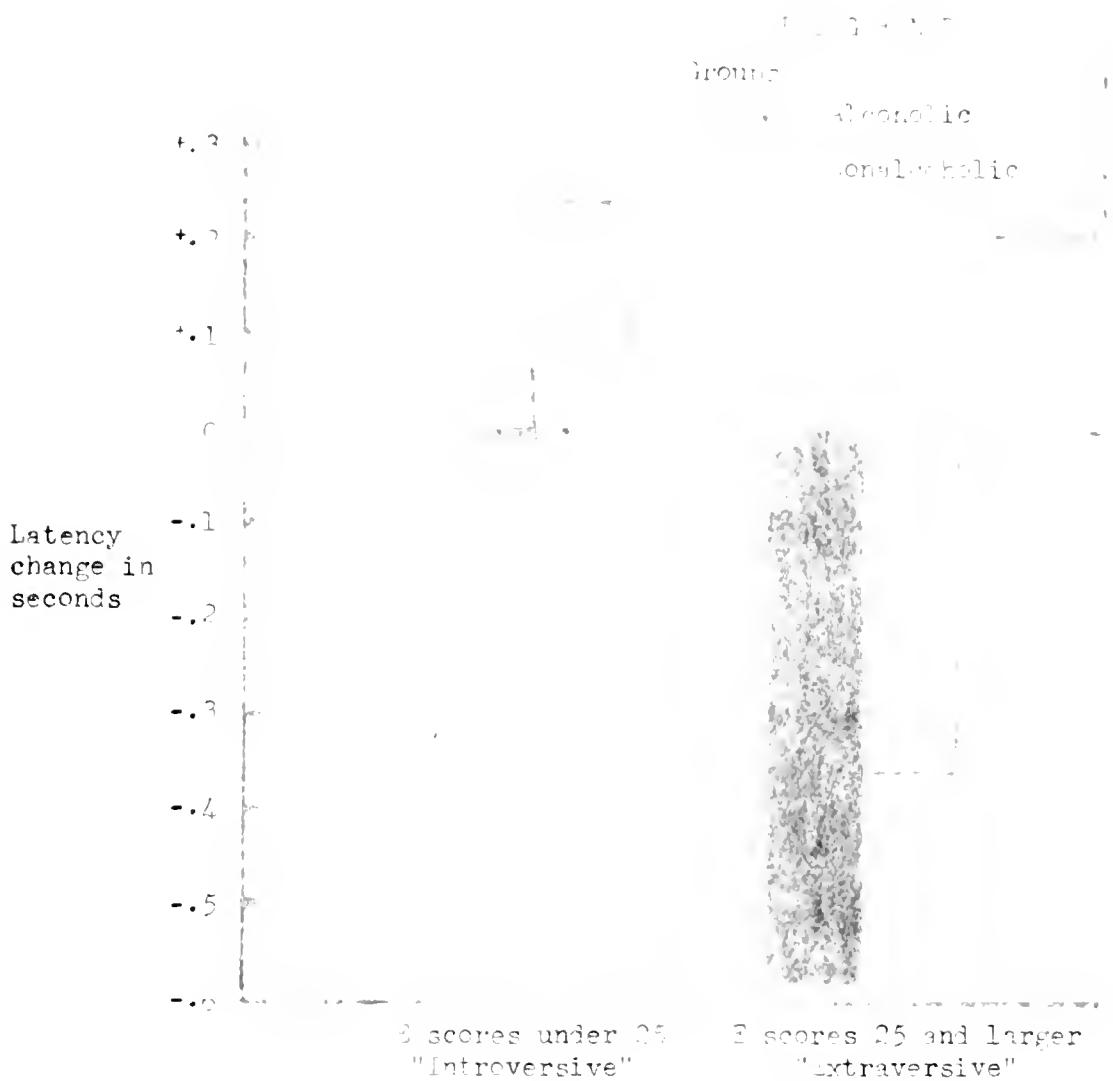


FIGURE 9

Mean change in unconditioned GSR latency  
 for higher and lower E score subjects in  
 an alcoholic and a nonalcoholic group



Summary of results

- (1) The conditioned GSR was not found to be established in fewer trials, or to be more resistant to extinction in alcoholics reporting solitary drinking than in those reporting never drinking solitarily.
- (2) The conditioned response was not elicited in fewer trials and was not more resistant to extinction in alcoholics reporting a longer time between occurrence of the first blackout and onset of frequent blackouts, than in those reporting a shorter time between these events.
- (3) The conditioned GSR was established in fewer trials and was more resistant to extinction in alcoholics reporting steady drinking than in those reporting periodic drinking.
- (4) In alcoholic and nonalcoholic subjects, the conditioned GSR was elicited in fewer trials and was more resistant to extinction in introversive subjects than in extraversive individuals.
- (5) All alcoholic and nonalcoholic subjects who failed to display the conditioned GSR in the maximum number of acquisition trials had extraversive test scores.
- (6a) The latency of the conditioned GSR was found to relate not only to the extraversive personality factor, but also to the alcoholic - nonalcoholic variable. Among nonalcoholics, introversive subjects displayed a conditioned response with shorter latency than did extraversive subjects. In the alcoholic group, extraversive subjects displayed shorter response latency than did introversive alcoholics.



(6b) Extraversive subjects in alcoholic and nonalcoholic groups displayed a faster initial unconditioned GSR than did introversive subjects in these two groups.

(7) When the conditioned response was established, the unconditioned GSR tended to be slower than it had been when the conditioning trials began. This change was more marked in alcoholics as compared with nonalcoholics, and in both groups the tendency to respond slowly was more marked in extraversive than in introversive subjects.

#### DISCUSSION AND CONCLUSION

Alcoholic and nonalcoholic subjects in the introversive category displayed a conditioned response which was more quickly elicited and more resistant to extinction as compared with extraversive alcoholics and nonalcoholics. Since covariance analyses were performed in this study, differences in conditioning observed between introversive and extraversive subjects are independent of differing neuroticism scores among the subjects. The results of this study indicate that neuroticism scores had little influence on conditioning measures, for similar results could be obtained for two of the three measures (acquisition, and conditioned GSR's prior to extinction), if only variance analyses are employed. The significant relation observed between GSR conditioning and extraversion, as indicated by scores on the MPI, is in line with other research (Franks, 1956; Franks, 1957) on conditioned eyeblink in normal and neurotic subjects. These studies might be interpreted to



support Eysenck's theory of personality. Less extraversion or more introversion is associated with faster acquisition and slower extinction of a conditioned response (i.e. more conditionability).

Alcoholics reporting steady drinking developed a conditioned GSR more quickly and extinguished this response more slowly than did periodic drinkers. If the validity of these drinking reports is assumed, some theory and experimental evidence on conditioning could be employed to account for these two different drinking patterns. The autonomic GSR has been employed frequently as an index of a subject's emotionality. Mowrer's two-factor learning theory (1950) suggests that socialization is a learning process mediated to a large extent by conditioning reactions of an autonomic kind (anxiety). On the basis of some experimental evidence that alcohol ingestion produces a reduction in the strength of fear (Conger, 1951), learning theorists have suggested that the alcohol drinking response may be explained in terms of reinforcement (Dollard & Miller, 1950, pp. 185-190). Drinking alcohol when fearful or frightened would be rewarded by immediate drive reduction. The principle of gradient of reinforcement is employed to explain why the immediate reinforcing value of alcohol maintains this drinking response. The effectiveness of punishment (e.g. hangover, remorse) in extinguishing a response is reduced the longer it is delayed from the response.

To the extent that alcohol drinking is a learned drive-reducing response, and differences in GSR conditionability observed between steady and periodic drinkers indicate differences in general autonomic or emotional conditioning, some hypotheses accounting for differing drinking patterns may be offered. Subjects with greater autonomic conditionability



right develop and maintain more conditioned autonomic anxiety responses to a variety of stimuli. Following Mowrer (1950), it is suggested that learned drive-reducing behaviour (e.g. drinking alcohol) becomes conditioned to these autonomic responses. Since an alcoholic may be expected to have numerous difficulties in social, economic and personal adjustment, it is likely that anxiety would be aroused frequently. The learned drive-reducing response of drinking alcohol would probably be practiced more frequently or regularly. Conversely, poorer autonomic conditioning would likely result in fewer conditioned autonomic responses to fearful stimuli and fewer conditioned drive-reducing responses. While drinking alcohol may still be a drive-reducing response, this behaviour might be evoked less frequently, or less regularly by any conditioned autonomic fear response. Drinking alcohol might rather be directly elicited by immediate external stimuli. The evidence in study 1 indicated that periodic drinking was associated with extraversive test scores. Eysenck's suggestion that extraversion is associated with impulsive reaction to immediate (rather than autonomic) stimuli appears to be consistent with the above discussion. He comments ". . . the extravert is more dependent on external stimuli; rewards, punishments and the immediate group" (Eysenck 1957, p. 213).

It was suggested that alcoholics may differ in the ease with which an autonomic nausea response is conditioned. This study found that both the introversive-extraversive personality variable, and the steady-periodic drinking behaviour were related to GSR conditionability. To the extent that the GSR and the nausea response may be comparable, introversion-extraversion and reports of steady and periodic drinking



both may be useful criteria on which to distinguish those alcoholics who more readily develop and maintain a conditioned nausea response to alcohol.

Solitary drinking, as assessed by alcoholics' reports of this behaviour, was found not to relate to conditioning measures. Differences in time intervening between first alcoholic blackout and onset of frequent blackouts were not related to differences in GSR conditioning. These time scores were obtained from the difference between an alcoholic's ages reported for these two events. The failure to find a significant relation may be due to one of two possibilities. The assumptions employed in this research to calculate intervening time may not be valid, or conditioning behaviour may not be related to the time intervening between first blackout and onset of frequent blackouts. In the design of this research, either factor could have occasioned the nonsignificant findings.

It was predicted that a predominance of extraversive subjects would be obtained in the group which did not display the conditioned response within the maximum number of acquisition trials. This hypothesis was confirmed by the observation that all nonconditioning subjects had extraversive test scores. Since eight of the nine subjects in this group were alcoholics, this finding could suggest that difficulty in GSR conditioning under the procedures of this study is more typical of alcoholics than of individuals who are not hospitalized for alcoholism or other psychiatric disorder.

In contrast to a mean extraversion score of 29.05 obtained by the 20 extraversive alcoholics who displayed GSR conditioning, the alcoholics who did not condition had a mean score which was even larger



(32.36). This might suggest that failure to display GSR conditioning is associated with an extreme degree of extraversion, as this is indicated by unusually high scores on the NPI test of extraversion. If some of the theoretical notions related to excessive extraversion are considered, other aspects of the behaviour of the nonconditioned alcoholics become relevant. According to Eysenck (1957), greater extraversion is associated with organic brain damage and with behaviour commonly observed in individuals diagnosed as "psychopathic." There is some research to indicate that subjects with organic brain damage are more difficult to condition (Reese et al., 1953). The psychiatrists' reports in the files of nonconditioning alcoholics were accordingly examined for the incidence of organic brain damage and of the diagnosis "psychopathic character disorder." Organic brain damage occurred in one of eight cases, while two subjects were diagnosed "psychopathic character disorder." In order to compare the frequency with which these factors are attributed to alcoholics who display GSR conditioning, a similar survey was conducted on the files of the 40 alcoholics employed in this study. Organic brain damage was indicated in two of these cases and only five of the forty subjects received the psychopathic diagnosis. The unequal groups, and the small number of cases in this survey permit no conclusion about incidence of organicity and psychopathic behaviour among nonconditioning alcoholics. Further research would be required to test such an hypothesis.

Some of the subjects who displayed the conditioning pattern verbalized no awareness of the systematic presentation of the bell



with the conditioned stimulus. In this case, the bell frequently was mistakenly identified as a ringing telephone. Although subjects had no prior familiarity with the conditioning apparatus, it is almost certain that the academic backgrounds of some of the nonalcoholic subjects would make them sophisticated in terms of conditioning techniques. These subjects, however, were not observed to condition in consistently fewer trials than those who were completely naive to this procedure. The speed at which the conditioned GSR was established and extinguished appeared to be unrelated to a subject's prior knowledge of conditioning techniques and to his failure to comprehend the systematic presentation of stimuli. This observation could suggest that the conditioned GSR is not under voluntary control and perhaps may occur "unconsciously" (i.e. when awareness is not verbalized). This suggestion is in accord with other findings on GSR conditioning (Wall & Guthrie, 1959) and on another conditioned autonomic response, finger twitch (Hefferline, Keenan & Harford, 1959). These studies indicate that verbal instructions, or a subject's prior knowledge of the required response does not influence the speed with which the conditioned response is established or extinguished. The presence or absence of the conditioned response appears to be determined by the actual presentation of the reinforced or unreinforced conditioned stimulus.

Learning theorists frequently suggest that response strength may be assessed by any one of three measures. A stronger conditioned response may be indicated by: 1) more trials to extinction, 2) larger amplitude, 3) shorter latency. Other writers have observed that these three measures frequently do not yield comparable estimates of response



strength (Osgood, 1953, pp. 325-328). Since latency is found to reflect changes after the other measures reach stable values, and frequently yields results incompatible with the other measures, it is often considered to be a more "sensitive" measure of a response. In this study, the alcoholic and nonalcoholic groups were indistinguishable in the speed of acquiring and extinguishing the conditioned GSR, but these two groups differed in the latency of this response. Introversion-extraversion was found also to relate differently to latency measures in these two groups. This evidence could suggest that some of the variability commonly observed in conditioned response latency relates to the personality variable of introversion-extraversion. It is also possible that these relations may be distinctive for alcoholic and nonalcoholic groups. Further investigation of the relation between introversion-extraversion and GSR latency in other psychiatric populations would be necessary to examine these hypotheses.

The evidence that a weaker unconditioned GSR (i.e. longer latency) is displayed by introverts as compared with extraverts alcoholics and normals, suggests some hypotheses for future research. Since introverts subjects also conditioned more quickly, it is possible that latency of an unconditioned GSR relates to speed of developing conditioned responses. If some of the theoretical distinctions between introverts and extraverts subjects are considered, other interpretations may also be placed on this evidence. Extraverts individuals are considered to be more responsive to external stimuli (Eysenck, 1957). Since this study employed a bell stimulus to elicit the unconditioned



GSR, the greater initial unconditioned response strength displayed by extraversive subjects may reflect a greater reactivity or sensitivity to objective environmental stimuli. Pursuing this line of argument, it might be predicted that a more subjective emotion-evoking stimulus would elicit a stronger initial unconditioned GSR (i.e shorter latency) in introversive subjects.

As the conditioning procedure progressed, the unconditioned GSR tended to become weaker (i.e. latency increased). This observation is consistent with other GSR studies which suggest that "lessened reactivity," or "adaptation" or increased latency of the unconditioned GSR occurs with continuous repeated presentations of the stimulus (Reese et al., 1953; Winokur et al., 1959). This study, however, found adaptation or weakening of response to be more marked in alcoholic, as compared with nonalcoholic subjects. Further research may find greater GSR adaptation to be a peculiarity of alcoholic subjects. Since adaptation or weakening of response may be comparable, in some respects, to short attention span or distractability which is frequently observed in alcoholic and other neurotic subjects, GSR adaptation might be fruitfully investigated in other psychiatric groups. It is also important to note that adaptation as indicated by the increasing unconditioned GSR latency, was more pronounced in extraversive than in introversive subjects. This finding is understandable in view of the fact that extraversive subjects required more trials to develop the conditioned GSR. Under the conditioning procedure of this study, they received more presentations of the unconditioned stimulus than did introversive subjects and thus could be expected to display greater adaptation.



## VII. CONCLUSION

Two exploratory studies indicated that introversion-extraversion was related both to some drinking behaviour reported by alcoholics, and to aspects of GSR conditioning behaviour.

The major study investigated the relation between drinking behaviour and conditioning. A conditioned GSR was more quickly elicited and more resistant to extinction in alcoholics reporting patterns of steady drinking than in those reporting periodic drinking. The relation between introversion-extraversion and ease of conditioning was found not to differ between alcoholic and nonalcoholic subjects; the conditioned response was more quickly acquired and more slowly extinguished in introversive than in extraversive subjects. Alcoholics and nonalcoholics did not differ either in introversion-extraversion or in rate of establishing and extinguishing the conditioned response. An examination of GSR response latencies indicated differences between alcoholics and nonalcoholics which were related to introversion-extraversion in a complex manner.



## VIII. SUMMARY

This research was designed to investigate individual differences in alcohol drinking behaviour in relation to ease of conditioning a galvanic skin reflex (GSR) in male in-patients of an alcoholism clinic. The hypotheses for this investigation were derived from findings in two preliminary studies.

Pilot study 1 suggested that some drinking behaviour commonly reported by alcoholics may relate to "introversion-extraversion," as defined by test scores on the Maudsley Personality Inventory. An examination of these hypotheses found that introversive alcoholics predominantly reported steady drinking, solitary drinking, and a longer time between the first alcoholic blackout and the onset of frequent blackouts; extraversive alcoholics more often reported periodic drinking, no solitary drinking, and a shorter time between first blackout and onset of frequent blackouts.

The hypotheses for the second pilot study were derived from literature suggesting that introversion-extraversion relates to a subject's general ability to acquire conditioned responses. Reports on the conditioned aversion treatment of alcoholism indicated individual differences among alcoholics in ease of conditioning a nausea response. Since nausea could be considered to have some autonomic response components, a laboratory study of GSR conditioning was selected to begin an examination of the relation between introversion-extraversion and autonomic conditioning in alcoholics. A conditioned GSR was found to be more quickly elicited and more slowly



extinguished in introversive, than in extraversive alcoholics.

The major study obtained measures of GSR conditioning from 40 male in-patients of an alcoholism clinic, and from 40 nonalcoholic male volunteers. Both groups completed the Maudsley Personality Inventory, and the alcoholics also reported their alcohol drinking behaviour. Ease of GSR conditioning was found not to relate to alcoholic's reports of solitary drinking or of blackouts. Alcoholics reporting steady drinking more quickly established the conditioned GSR, and more slowly extinguished this response than did those reporting periodic drinking. To the extent that alcohol drinking is a learned response and this learning is comparable to conditioning, knowledge of characteristic individual differences in learning as indicated in GSR conditioning may be useful in accounting for the development of steady or periodic alcohol drinking. This information also might have practical application in the conditioned aversion treatment of alcoholism, and in other therapy which employs conditioning principles in an attempt to develop and extinguish responses.

Introversive subjects in the alcoholic and the nonalcoholic group were found to develop a conditioned response more quickly and to extinguish this response more slowly than extraversive subjects in these groups. No differences in GSR conditioning were observed between alcoholics and nonalcoholics. These results are consistent with predictions which might be made from Eysenck's theory of personality.

An examination of GSR latencies demonstrated differences between alcoholic and nonalcoholic groups in relation to introversion-extraversion.



These findings, in addition to certain observations of subjects who did not display GSR conditioning, led to suggestions for further research.



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A P P E N D I C E S



APPENDIX A

R E S E A R C H   Q U E S T I O N N A I R E

NAME (print).....  
(family name) (given names)

AGE,.....BIRTH DATE.....PLACE OF BIRTH.....  
(day) (month) (year)

ADDRESS,.....PHONE,.....

This information will be used for research purposes only. Please be as accurate as you can for your answers are important in helping to understand alcoholism. Be sure to answer every question; a partly completed form is useless for scientific purposes.



1. How often have you been hospitalized in a clinic or hospital for the treatment of alcoholism. (If hospitalized at present, include this in your answer).....
2. Are you more inclined to be a FLASH IN DRINKER, (do most of your drinkin in bouts of 2, or 3, or more days, either not drinkin at all between bouts, or only very moderately) OR are you more inclined to be STEADY DRINKER, (drinkin more or less the same amount at regular, frequent intervals).....
3. If you are more inclined toward FLASH DRINKING:  
(a) How long, on the average, do your bouts last?.....  
(b) How long generally, are the intervals between bouts?.....  
(c) When on a bout, how much on the average do you drink in a day? (Indicate number of bottles).  
  
Beer..... Bottles  
Wine..... Bottles  
Spirits (whiskey, brandy, etc.)..... Large Bottles:..... Small Bottles
4. If you are more inclined toward STEADY DRINKING:  
(a) How much on the average do you drink in a day? (Indicate number of bottles).  
  
Beer..... Bottles  
Wine..... Bottles  
Spirits (whiskey, brandy, etc.)..... Large Bottles:..... Small Bottles
5. How many meetings of Alcoholics Anonymous have you attended?.....
6. When did you first attend A.A.?.....  
(month) (year)
7. Have you ever sought help from a hospital or clinic for the treatment of alcoholism?.....
8. How long did you participate in its treatment programme? (This includes, continuing after discharge from hospital, evening social groups or psychotherapy, or discussion meetings, etc.)?.....
9. If you have tried both A.A. and clinic treatment, which do you prefer, or do you feel has, or may be of greater help to you. Check:  
A.A..... Both the same..... Clinic.....

#### Drinking History

The order of the following questions is not meant to suggest a sequence. It is likely that these events happened to you in different order than that indicated in the questions, or may not have happened at all. The examples used after the questions are not the only ones which illustrate what is meant by the question, but are only intended to suggest the kind of thing that the question refers to. If you have had the experience described below, and if you remember your age (or approximate age) at the



time it first occurred, please state that age in the first column. If you do not remember your exact age, make an estimate of the age, and if you are very uncertain of this estimate, circle your answer. If you did not have this experience please put a checkmark in the column headed "NEVER".

A PARTIALLY COMPLETED FORM IS USELESS FOR RESEARCH PURPOSES - LEAVE NO BLANKS

	<u>Age</u>	<u>Never</u>
10. Age when you first felt that there were certain life situations (with job, friends, family etc.) which you could not face without a drink.	....	.....
11. Age when you began to feel that you were more efficient after one or two drinks.	.....	.....
12. Age when you first found you had to "step up" your alcohol consumption to get much effect.	.....	.....
13. Age at first occasion of having a "blackout". (Example: Wake up the morning after a party with no memory at all as to where you had been or what you had done after a certain point. This is <u>not</u> the same as "passing out", or becoming unconscious.	....	.....
14. Age when having "blackouts" began to occur frequently. (That is, at least 2 or 3 times out of 10 drunks.)	.....	.....
15. Age when you started solitary drinking.	.....	.....
16. Age when you began to think of some formerly well-liked friends as "stuffed shirts".	.....	.....
17. Age when friends began to walk out on you because of your drinking	.....	.....
18. Age when you first sought medical advice or aid because of some bodily ailment due to drinking.	.....	.....
19. Age when you began admitting to yourself that your drinking was beyond control and that you were licked.	.....	.....
20. Age when you began to have uncontrollable tremors. (That is, "jitters" or "shakes".)	.....	.....



INSTRUCTIONS: Please answer each question by putting a circle round the "Yes" or the "No" following the question; if you simply cannot make up your mind, encircle the "?". Work quickly and do not ponder too long about the exact shade of meaning of each question. There are no right or wrong answers, and no trick questions.

MEMBER TO ANSWER EACH QUESTION.

- 1. Are you inclined to limit your acquaintances to a select few?.....Yes ? No
- 2. Do you prefer action, to planning for action?.....Yes ? No
- 3. Do you nearly always have a "ready answer" for remarks directed at you?.....Yes ? No
- 4. Are your daydreams frequently about things that can never come true?.....Yes ? No
- 5. As a child, did you always do as you were told, immediately and without "rumbling"?.....Yes ? No
- 6. Are you inclined to be quick and sure in your action?.....Yes ? No
- 7. Do you have difficulty in making new friends?.....Yes ? No
- 8. Do you sometimes put off until tomorrow what you ought to do today?.....Yes ? No
- 9. Are you inclined to take your work casually, that is, as a matter of course?.....Yes ? No
- 10. Do you often feel disgruntled?.....Yes ? No
- 11. Are you inclined to ponder over your past?.....Yes ? No
- 12. If you say you will do something, do you always keep your promise no matter how inconvenient it might be to do so?.....Yes ? No
- 13. Do you like to mix socially with people?.....Yes ? No
- 14. Are you inclined to be shy in the presence of the opposite sex?.....Yes ? No
- 15. Do you sometimes get cross?.....Yes ? No
- 16. Do you often experience periods of loneliness?.....Yes ? No
- 17. Are you touchy on various subjects?.....Yes ? No
- 18. Do you often find that you have made up your mind too late?.....Yes ? No
- 19. Are you completely free from prejudice of any kind?.....Yes ? No
- 20. Are you inclined to be overconscientious?.....Yes ? No
- 21. Do you often "have the time of your life" at social affairs?.....Yes ? No
- 22. Do you ever change from happiness to sadness, or vice versa, without good reason?.....Yes ? No



23. Do you like to play tricks upon others?.....Yes ? No

24. Do you sometimes laugh at dirty jokes?.....Yes ? No

25. Does your mind often wander while you are trying to concentrate?.....Yes ? No

26. Would you rate yourself as a tense or "tigh-strung" individual?.....Yes ? No

27. After a critical moment is over, do you usually think of something you should have done but failed to do?.....Yes ? No

28. Would you much rather win, than lose, a game?.....Yes ? No

29. Do you find it easy, as a rule, to make new acquaintances?.....Yes ? No

30. Do you ever have a queer feeling that you are not your old self?.....Yes ? No

31. Do you ever take your work as if it were a matter of life or death?.....Yes ? No

32. Are you frequently "lost in thought" even when supposed to be taking part in a conversation?.....Yes ? No

33. Do you always feel genuinely pleased when a bitter enemy achieves a merited success?.....Yes ? No

34. Do you derive more real satisfaction from social activities than from anything else?.....Yes ? No

35. Do ideas run through your head so that you cannot sleep?.....Yes ? No

36. Do you sometimes boast a little?.....Yes ? No

37. Can you usually let yourself go and have an hilariously good time at a gay party?.....Yes ? No

38. Do you like to indulge in a reverie (daydreaming)?.....Yes ? No

39. Have you often felt listless and tired for no good reason?.....Yes ? No

40. Are all your habits good and desirable ones?.....Yes ? No

41. Are you inclined to keep quiet when out in a social group?.....Yes ? No

42. Are you sometimes bubbling over with energy and sometimes very sluggish?.....Yes ? No

43. Do you always answer a personal letter as soon as you can after you have read it?.....Yes ? No

44. Would you rate yourself as a talkative individual?.....Yes ? No

45. Do you occasionally have thoughts and ideas that you would not like other people to know about?.....Yes ? No

46. Would you be very unhappy if you were prevented from making numerous social contacts?.....Yes ? No



17. Are you happiest when you get involved in some project that calls for rapid action?.....Yes ? No

42. Do you spend much time in thinking over good times you have had in the past?.....Yes ? No

49. Do you sometimes talk about things you know nothing about?.....Yes ? No

50. Have you ever been bothered by having a useless thought come into your mind repeatedly?.....Yes ? No

51. Do other people regard you as a lively individual?.....Yes ? No

52. Do you sometimes gossip?.....Yes ? No

53. Do you usually keep in fairly uniform spirits?.....Yes ? No

54. Are your feelings rather easily hurt?.....Yes ? No

55. At times, have you ever told a lie?.....Yes ? No

56. Do you generally prefer to take the lead in group activities?.....Yes ? No

57. Would you rate yourself as a happy-go-lucky individual?.....Yes ? No

58. Have you money worries at times?.....Yes ? No

59. Do you have periods of such great restlessness that you cannot sit in a chair very long?.....Yes ? No

60. Are you usually a "good mixer"?.....Yes ? No

61. Would you rate yourself as a lively individual?.....Yes ? No

62. Have you ever been late for an appointment or work?.....Yes ? No

63. Do you ever feel "just miserable" for no good reason at all?.....Yes ? No

64. Are you often troubled with feelings of guilt?.....Yes ? No

65. Are you inclined to be moody?.....Yes ? No

66. Do you like to have many social engagements?.....Yes ? No

67. Once in a while, do you lose your temper and get angry?.....Yes ? No

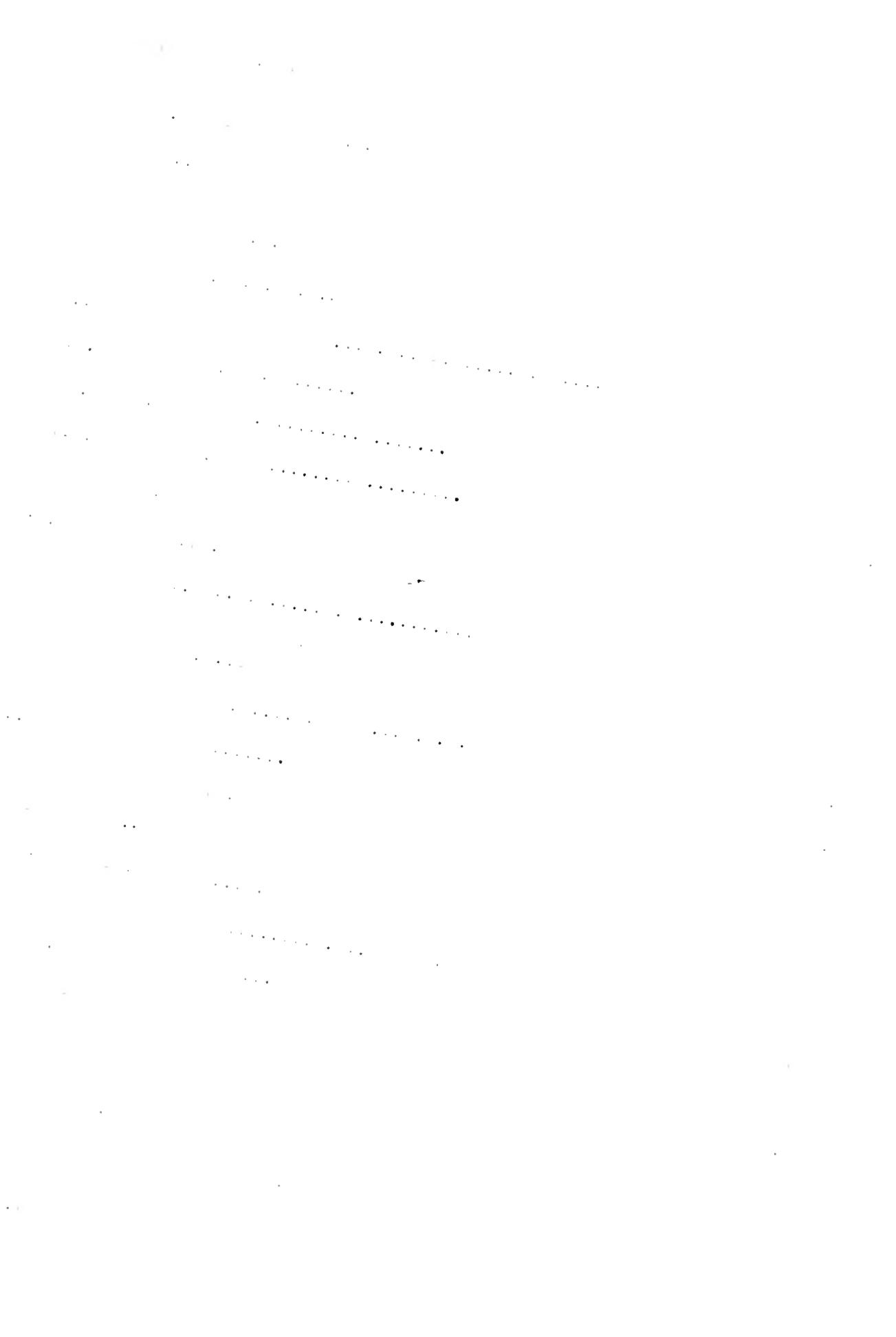
68. Do you sometimes feel happy, sometimes depressed, without any apparent reason?.....Yes ? No

69. Is it difficult to "lose yourself" even at a lively party?.....Yes ? No

70. Are you ordinarily a carefree individual?.....Yes ? No

71. Do you have frequent ups and downs in mood, either with or without apparent cause?.....Yes ? No

72. Would you always declare everything at the Customs, even if you knew that you could never be found out?.....Yes ? No



73. Do you like work that requires considerable attention to details?.....Yes ? No

74. Are there times when you seem to be alone and you cannot bear the company of anyone?.....Yes ? No

75. Are you inclined to keep in the background on social occasions?.....Yes ? No

76. Have you often lost sleep over your worries?.....Yes ? No

77. Of all the people you know are there some whom you definitely do not like?.....Yes ? No

78. Do you usually feel disappointments so keenly that you cannot get them out of your mind?.....Yes ? No

79. Do you usually take the initiative in making new friends?.....Yes ? No

80. Do you enjoy participating in a showing of "Rah Rah" enthusiasm?.....Yes ? No



## APPENDIX B

### Instructions:

This apparatus measures your skin resistance to an electrical current. This measure depends on how moist your skin is, and this in turn depends on how active you are. You will notice from this dial that when I place the electrodes on my hand (demonstrate), it records slight changes occurring just while I speak to you. These are the changes that I am interested in measuring. It is very important not to move your hand, or to shift about in the chair (demonstrate), as this also causes the needle to jump and this will spoil the recording.

Since these changes depend partly on what one is doing, I ask everyone to do the same thing. Your task is to spell the nonsense syllables (point) which appear in this space, for example, "A, B, C," or "H, I, J,." This is not a spelling or a memory test, and if you make a mistake, you need not correct your spelling. The important thing is that you are doing something at a slow, steady rate, that you just relax, and do not move about.

If you are ready, we will begin now.



Distribution of conditioning scores among 8 alcohol drinking behaviour categories employed in a 2 x 2 x 2 analysis of variance

Category	Number of cases	Steady, solitary <sub>1</sub> drinker.	Steady, solitary <sub>2</sub> drinker.	Steady, not solitary <sub>2</sub> drinker.	Periodic, solitary <sub>1</sub> drinker.	Periodic, solitary <sub>2</sub> drinker.	Periodic, not solitary <sub>1</sub> drinker.	Periodic, not solitary <sub>2</sub> drinker.
		6	7	3	2	8	6	5
Acquisition trials	9	10 11* 2*	4* 8* 5	6 7* 2*	3* 6*	14* 19 15	14* 17 10*	15* 16 17*
	5	5	4	7	14*	18 19	15 2	14* 13 9 14* 6
	6	6	7	6	14*	14		
GSR's in extinction trials	10	6* 6*	6 8* 6	4 3* 7*	3* 4*	3* 1* 1	3* 4 2*	4* 4 7 0*
	4	4	7*	5	7	3 3 3	2 2 3	5
	6	6	5	5	5	2 0	2 3	
	8	8	7	7	7	0	4	
	7	7	5	5				
GSR's prior to extinction	10	1 10*	15 9* 18	5 1*	10* 4*	4* 1 3	3* 0 2*	8* 4 10 0*
	8	8	13*	13*	10*	1	2*	4 10 9
	13	13	7	12	12	4	7 0	
	10	10	2				3	
						4		

\* Scores randomly selected for the analyses presented in the thesis.

1 Difference of 2 or less between reported ages of first and frequent blackouts.

2 Difference > 2 between reported ages of first and frequent blackouts.







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Theses, Ph.D., 1960. Vogel, M.D.. Alcohol  
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